THE MORBID ANATOMY OF THE HUMAN EYE.

LONDON: PRINTED BY W. NICOL, 51, PALL MALL.

THE

MORBID ANATOMY

OF THE

HUMAN EYE.

BY

JAMES WARDROP,

SURGEON TO THE LATE KING.

ILLUSTRATED BY COLOURED PLATES.

SECOND EDITION.

VOL. I.

LONDON:

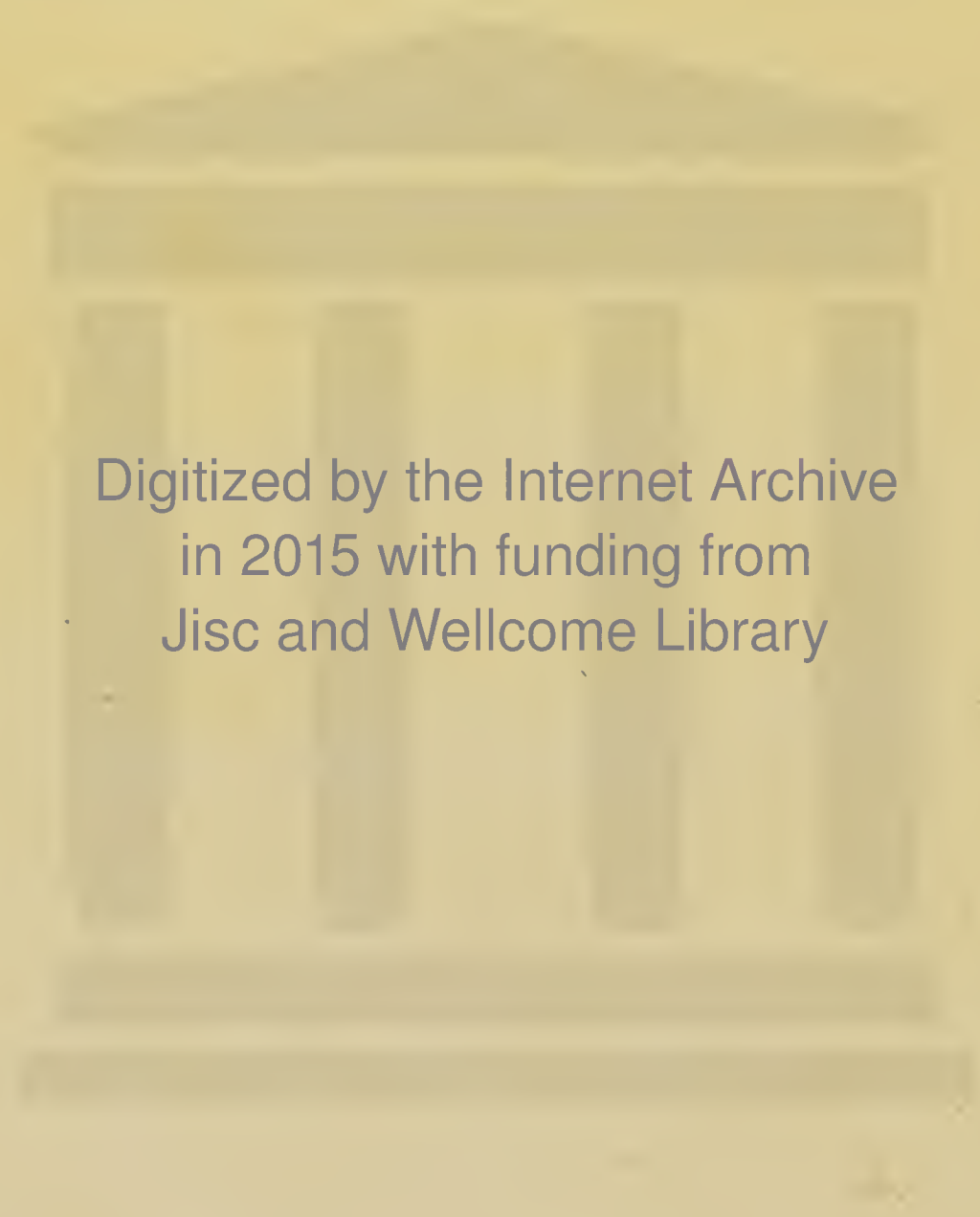
JOHN CHURCHILL, PRINCES STREET, SOHO.

1834.

ADVERTISEMENT.

Nothing would have prevented the Author from supplying the demand which has for some years past been made for this Work, but difficulties in getting the plates as accurately coloured as in the former edition, and he embraces this opportunity of remarking, that, although twenty-six years have elapsed since the Morbid Anatomy of the Eye was first published, the care with which he selected the materials is satisfactorily proved by the circumstance, that subsequent researches in this interesting department of Pathology have not contributed any additional facts to render any alteration in the work desirable.

Charles Street,
St. James's Square,
July, 1834.



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IN THE PRESS.

PART I. ON SURGICAL OPERATIONS.

PART II. ON BLOOD-LETTING.

Each Part, of which these are the commencement of a Series, will be published separately.

PREFACE

TO THE

FIRST EDITION.

THE object of the following Essays is to describe the various morbid alterations in the structure of the Human Eye, and to illustrate, by Engravings, those which are most remarkable.

In the accurate and detailed view which Dr BAILLIE has given of the morbid anatomy of some of the most important parts of the body, the diseases of the Eye are not described; and, as no attempt has yet

been made in this country to treat of the pathology of this organ, little apology seems necessary for the present undertaking. Several excellent practical treatises and detached essays have, indeed, been at different times published; but, during the last thirty years, the diseases of the Eye do not appear to have excited the same attention in this country as on the continent of Europe.

Richter, of Gottingen, has, perhaps, given the best description of these diseases, and laid down the most judicious practical rules that have yet been suggested. Beer and Schmidt, of Vienna, have contributed many useful hints; Voigtel and Sybel have collected a great store of facts connected with

the morbid anatomy of the eye; and Scarpa, Conradi, and others, have likewise enlarged our knowledge of the treatment of the diseases of this organ. None of these authors, however, have delineated the morbid changes of structure which they have described: A few drawings only are to be found in the works of Beer and Scarpa, and in some periodical publications. The importance of a work, the object of which is to supply these defects, is sufficiently obvious.

The opportunities which the Eye affords to the pathologist, from the variety in its structure and situation, of discriminating all its morbid changes, and observing their progress, render its diseases peculiar-

ly interesting; and as there is no organ, the loss of which can be productive of so many disadvantages, and so various and bitter calamities, without entirely destroying the existence of the individual, its diseases claim the most patient investigation, and deserve the most minute attention of medical men.

Although the following pages are devoted exclusively to the investigation of the diseases of one organ, the author is fully sensible that the task which he has undertaken is attended with considerable difficulty and labour; but if they shall, in any degree, contribute to the attainment of the end proposed, or if they even excite the attention of medical men to so interesting a subject, he will

deem his labours well rewarded. It is by continued attention alone, and by the patient investigation of changes produced by disease in all the organs which compose the human body, that we can expect to extend the knowledge of the morbid anatomy of each; whilst, at the same time, it is by a detailed account of the diseases of each separate organ that we can arrive at any general conclusions. But the field of medical science is very extensive, and to explore it with success, requires the co-operative efforts of many individuals; for it is only in proportion as facts are accumulated, and the various morbid appearances investigated, that the phenomena of disease can be understood,

the morbid actions explained, the science of medicine freed from erroneous theories and hypotheses, and its practice liberated from the rash and unskilful hand of empiricism.

The progress which has lately been made in pathological science, is a sufficient stimulus to exertion, and affords every reason to expect ultimate success. To use the words of Dr Reid, "We may, by caution and humility, avoid error and confusion. The labyrinth may be too intricate, and the thread too fine to be traced through all its windings; but if we stop where we can trace it no further, and secure the ground we have gained, there is no harm

done; a quicker eye may, in time, trace it further."

In the following Essays, the author has not only stated what he has had an opportunity of observing himself, but he has endeavoured to collect information from the works of the respectable authors whose names he has already mentioned, and from every other source to which he could find access. He ought also to acknowledge himself indebted to the liberality of many of his medical friends, from whom he has derived many useful hints, and who have afforded him opportunities of examining diseases which were either uncommon, or particularly worthy of notice.

For the Drawings which accom-

pany this work, the author is, in a particular manner, indebted to Mr Syme, an ingenious artist of this city. He has combined the art of the painter with the skill of the anatomist; and as he has retouched all the impressions of the Plates, there is a truth and accuracy preserved in the colouring, which are seldom met with in works of this kind.

In some of the Drawings, several diseases are represented; for every opportunity was embraced of delineating an eye affected with more than one complaint, in order to avoid multiplying the number of Engravings.

Those who are not much accustomed to examine the morbid ap-

pearances of the Eye, may begin with consulting the Plates, as they will thence be enabled to form a general idea of the disease represented, and the subsequent account will thus become more clear and intelligible.

If the public shall approve of this Essay, it is the author's intention to prosecute his plan, by considering the remaining Diseases of the Eye and its Appendages, and the Treatment which such diseases require.

Edinburgh,
April 1808.

CONTENTS.

PRELIMINARY OBSERVATIONS.

All animals are composed of a certain number of organs, which, under the influence of the vital principle, produce those wonderful phenomena that distinguish living organized bodies. An acquaintance with the relative position, magnitude, and direction of these organs, is one of the objects of anatomical researches: On this the surgeon builds all his theories, and it guides his hand in every operation. But, for the advancement of physiological and pathological science, something more than this

species of anatomy is necessary. It can only be considered as the first step towards a knowledge of the functions, but it does not even serve this purpose except under particular circumstances. When the anatomist divided the body into regions and districts, and shaped his inquiries to suit his unnatural divisions, every organ appeared insulated and detached; the most minute parts might have been discovered and described, but their mutual connections and sympathies were unknown. Anatomy and physiology were then disjoined; the former was imperfect, and the latter could scarcely be said to exist.

A more minute and philosophical examination of the structure and properties of the different organs led the way to a knowledge of some of their functions, and pointed out the principles which should regulate the investigations of every rational physiologist. Haller was among the first to avail himself of the advantages of this plan. It conducted him to all his important discove-

ries ; and it has determined the progress of every scientific inquirer since his time. To it we are indebted for almost every improvement that has been made in this branch of science ; and it is the only method by which we can hope still further to augment our knowledge. In pursuing this track, the labours of modern anatomists have been well rewarded. They have freed physiology and pathology from the chimerical conjectures by which they were so long debased, so that they now begin to assume their rank among the sciences, and in some cases to afford a safe guide to the medical practitioner.

No one in our day has exerted himself more successfully in this field than the late celebrated Bichât. His *Anatomie Generale* is one of the most remarkable productions that has ever appeared in medical science. It has unfolded a path of investigation which was scarcely ever trodden before, and laid the foundation of a new anatomy and a new physiology. I cannot pretend here to do justice to the merits of this work,

nor to give a correct view of the facts and reasonings by which his doctrines are supported. They are as numerous and various as are the parts and functions of the living body. But, as I propose, in examining the pathological anatomy of the Eye, to adopt some of the principles which he has established, the following observations are deemed necessary, in order to explain the purport and tendency of the classification which I have followed.

Most of the organs of our body are made up of a variety of elementary parts, or Textures, each of which, in whatever situation it is found, affords uniformly the same physical properties. These are the elementary parts, which, by the diversity of their combinations, produce all the modifications of structure and functions which the different organs of animals exhibit. The study of these elementary parts, independent of the organs which they concur to form, is the object of *general* anatomy.

This method of considering organized

bodies is not an unnatural abstraction, nor a speculative refinement. It arises from the essential nature of their constitution, and it accords with every phenomenon with which we are acquainted. It may be traced in the observations of many of the older anatomists; and considered as the basis of some of the most ingenious physiological theories of the late celebrated Mr John Hunter. Although, therefore, at first sight, it may have the appearance of being arbitrary and artificial, it is nevertheless, I am persuaded, founded on the most approved principles of philosophical investigation. A knowledge of the qualities of the different parts of which our organs are composed, must afford the surest means of acquiring information concerning the functions of these organs, and of becoming acquainted with the changes which they undergo in disease.

On these principles Bichât has founded his anatomical system. To numberless experiments upon living animals, he added all the information which could be acquired by dis-

section. He employed chemical re-agents to supply the deficiencies of the knife, and examined with minuteness all the varieties of morbid structure. By these means he endeavoured to fix the characters of the elementary textures, and then proceeded to investigate their combinations, as they are naturally presented to us in the different organs.

Of these textures, he has enumerated twenty-one, each of which he has shown to be differently organized; and hence the dissimilarity of their properties, both in health and in disease. This is the ground-work of the whole fabric, and to it we must ultimately recur in every attempt, to account either for the natural or morbid appearances which are to be met with among organized beings.

I mean not at present to enter more minutely upon the consideration of the elementary textures, my object being merely to show, in a general manner, the effect of this anatomical arrangement on pathological

theories. In our notions of all local affections, its influence is obvious ; but in those diseases where there is no evident change of structure, and where many parts of the body seem to be disordered simultaneously, there is little room for the inquiries of the pathologist. It is, accordingly, in the former class of affections that the utility and advantages of General Anatomy are most apparent.

By this view of the subject we learn that diseases at their commencement are generally confined to one texture, the others of which the organ is composed remaining sound. This important truth is made manifest in many affections of the Eyes; but there is no part of the body, from which illustrations of the same doctrine may not be deduced. At different times we see inflammation attacking the conjunctiva, or the various textures which form the cornea ; at others, it is seated in the iris, in the capsule of the crystalline lens, or in the sclerotic coat. The same is true of the different

membranes of the brain; of the mucous, serous, and muscular textures which compose the stomach, and intestinal canal; of the cellular texture of the lungs; of the mucous membrane of the bronchiæ; or the serous membrane of the pleura.

But diseases are not only confined to one individual texture of an organ, as in the cases just mentioned; the symptoms and morbid changes are likewise uniformly the same in textures of a similar structure, in whatever part of the body these textures may happen to be found. Thus the serous membranes, which invest the lungs, the brain, the heart, the abdominal viscera, have one common character, when affected with a specific disease; so also have the mucous membranes, whether in the mouth, the nose, the vagina, urethra, or covering the eye-ball; and the same is observable of every individual texture which enters into the composition of our bodies. Dr Carmichael Smyth, * in this country, and Pinel, †

* Medical Communications and Inquiries, Vol. II.

† Nosographie Philosophique.

in France, did much in pointing out the variety in the phenomena of inflammation, in some of the different textures of the body. It was an attempt highly worthy of the authors; but they did not lay down any system, or draw any general conclusions; nor did they attempt to trace the same analogy in other diseases. Thus, although the morbid changes of some of the textures have been ascertained with tolerable accuracy, we are still ignorant of many of the others. This is a field which has hitherto been little explored. It is of boundless extent, and presents inexhaustible subjects of investigation to the genius and industry of future inquirers.

Besides the symptoms and morbid changes which are common to all textures the structure of which is similar in the natural state, there are others which are determined from the particular functions of the organ in which the diseased texture exists: For example, when any of the Serous membranes are inflamed, the nature of the pain, the de-

gree of fever, and the duration of the symptoms, are the same in whatever one it may have taken place. But to these symptoms are added cough, difficulty of breathing, &c. when it happens to be connected with the organs of respiration, as in the case of *pleuritis;* costiveness, stranguary, delirium, loss of vision, when the intestines, the bladder, the brain, or the eye, are involved in the disease.

This view of the subject naturally suggests a correspondent division of the symptoms. The first class are general, and characterize a whole genus of textures; the second are in a manner accessory, and depend upon the relative situation, or the particular functions of the organ, into the composition of which the affected texture enters.

The foregoing remarks will tend to explain the object of General Anatomy, and the important purposes to which it may be applied, both for illustrating pathology and therapeutics. But here we must set bounds to this theory;—the history and

progress of diseases show, that we ought not to confine our observations within such narrow limits. The principles which I have stated, indeed, account ingeniously for the propagation of some affections, and for some of the sympathies which subsist between different parts of the body; but there are other disorders which advance in a different manner. In some diseases which are termed chronic, for example, every texture of an organ becomes gradually altered, although the primary affection is confined to one of the component textures. This may often be observed in cancer, scrofula, lues venerea, &c. When cancer attacks the mamma, it is, at its commencement, generally confined to a small portion of that organ, but, if allowed to proceed, it ultimately involves the whole glandular, cellular, and cutaneous textures, in one common mass of disease.

The author from whom I have adopted some of the foregoing remarks has, with wonderful ingenuity, illustrated and established the theory which has now been in

part described. In his hands morbid anatomy has assumed a new aspect; and he has pointed out a method of classifying the numerous facts which that science embraces, with a degree of accuracy and precision that was never before known. In prosecuting this science, we ought to examine the symptoms and changes of structure which are to be found in every individual texture, in whatever organ or region they may exist, and, after ascertaining the alterations proper to every system, then we shall be better prepared to investigate the diseases as they take place in different organs of the body, or in different regions.

These general observations will be sufficient to give an outline of the principles of a pathological system, founded on the basis of anatomical knowledge; and when they are applied to the investigation of the morbid anatomy of the Eye, they will be found to afford a happy illustration of the system which I have ventured to adopt. For this beautiful organ is not only composed of a

great variety of textures, but the transparency and ready examination of most of its parts in the living body admit of a great minuteness and accuracy of observation ; and the various morbid changes can be much more distinctly observed than in any other part of the body.

The parts which form the Eye-ball, and which are immediately connected and subservient to the performance of its functions, as they present a great variety in structure, they are necessarily liable to a proportionate variety in their morbid changes. The external covering of the eye-ball, eye-lids, and lacrymal passages, or Conjunctiva, being a mucous membrane, we shall find that it is subject to all the diseases of mucous membranes in other parts of the body. The diseases of the Cellular membrane, which lies underneath the conjunctiva, are analogous to those of the cellular membrane in other organs. The Sclerotic coat, the Iris, the Choroid coat, the Crystalline lens, the Optic nerve, the Retina, and the different

parts which compose the Cornea, are also liable to morbid changes similar to those textures in other organs to which they are analogous; the various phenomena being more or less modified from the peculiarity of the functions of the organ.

In the descriptions of the Diseases of the Eye which are given in the following Essays, I shall divide them into two great classes. The first will contain an account of the morbid changes of each separate structure which enters into the composition of that organ; and the second, an account of those diseases which have a specific character, and have symptoms peculiar to themselves in whatever structure of the body they appear, or which, when they attack the Eye, affect a greater or less number of its different parts at the same time.

Under the first class will be comprehended the diseases of the Cornea, Iris, Aqueous, Vitreous, and Crystalline humours, Optic Nerve and Retina, Choroid coat, Sclerotic coat, Conjunctiva and Cellular membrane,

Tarsi and Palpebræ, Lacrymal Gland and Caruncle.

Under the second class will be included Gout, Rheumatism, Lues Venerea, Exanthematous Ophthalmia, Cancer, Fungus Hæmatodes, and Scrofula.

As to the order of treating these, I shall follow nearly that in which the different parts have now been mentioned, as it appears to me the most simple arrangement to begin with the parts which first present themselves when the organ is examined in its natural state.

CHAP. I.

GENERAL REMARKS ON THE CORNEA.

The cornea, in its natural state, possesses properties different from any of those classes of simple textures or membranes, into which anatomists have divided the component parts of the human body.

Some have conceived, that, in structure, the Cornea much resembles the Nails; but a superficial examination will be sufficient to shew, that there is little similarity between these two textures. The nails are not, like the cornea, separated by a particular fluid into distinct layers. They are not endowed with an equal degree of sensibility, nor are they liable to those diseases which affect the cornea. They are

not subject to inflammation; tumours are not observed to grow from their surface; neither are they capable of adhesion or cicatrization.

Others have attempted to demonstrate, that the Cornea is merely a continuation of the sclerotic coat; but the functions and diseases of these two membranes differ so much from each other, that they clearly indicate a difference of structure and qualities. The Sclerotic coat exhibits all the properties which the fibrous membranes possess. It has a shining, opaque, white, colour. It is composed of numerous filaments, running in every direction, which are closely interwoven with one another, and it cannot be divided into layers. The Cornea is organized in a manner totally different. It is formed of an indeterminate number of laminæ, which are easily separable from one another, either by the knife or maceration. They are also occasionally separated, in diseases, by the effusion of blood or pus. From

these circumstances, the cornea may be considered as a membrane *sui generis.*

But, though the Cornea possesses properties peculiar to itself, it will be found, that the structure, functions, and morbid changes, of some parts of this membrane, have a striking analogy to those of other textures in the animal economy.

Anatomists have shewn, that the external surface of the Cornea is a continuation of the conjunctiva. This covering seems referable to that class of membranes which have been denominated *mucous.* It can be separated from the subjacent parts by dissection ; it is of a softer texture, and tends more rapidly to putrefaction than the substance of the cornea. It is also nourished by the same vessels which supply the conjunctiva, covering the sclerotic coat, as may be seen when it becomes inflamed ; and it will also be shewn, that the diseases to which it is subject are those of mucous membranes.

The internal surface of the cornea is lined by the membrane that forms part of the

cavity which contains the aqueous humour, and perhaps it assists in the exhalation of that fluid. * According to the arrangement which I have adopted, it may, with propriety, be considered as a membrane of the *serous* class. This membrane may not only be demonstrated by dissection, but, as shall afterwards be shewn, it is subject to all the morbid changes of the serous textures. †

The substance of the Cornea, which is situated between these two membranes, is composed of concentric cellular laminæ, in the cells of which a peculiar fluid is deposited by the exhalents.

In the Fœtus, the cornea is usually tinged of a rosy colour, and is much thicker, but less convex and pellucid than in the adult. In old age, the cornea becomes horny, and sometimes as hard and gristly as a piece of cartilage. ‡

* *Tunica Humoris Aquei.*

† See Chap. XV. Vol. II.

‡ Angely. Comment. de Oculo Organisque Lacrymalibus.

In the description of the Diseases of the cornea, I shall begin with Inflammation, as it is the morbid affection which occurs most frequently, and as many of the other diseases to which the cornea is liable, are either preceded or accompanied by one of the various modifications of that state.

CHAP. II.

OF INFLAMMATION OF THE CORNEA.

The cornea in the sound eye is perfectly transparent, and none of its vessels admit the red particles of the blood; but, when Inflammation takes place, vessels carrying red blood may be distinctly seen ramifying through it, and every change which takes place in the number, in the mode of distribution, or in the colour of the contents of these vessels, may be accurately examined. Besides an increase in the vascularity, inflammation of the cornea is attended with more or less dimness, pain in the eye, intolerance of light, and those symptoms which usually take place when any other part of the organ of vision is inflamed.

The inflammation, however, does not usually affect all the textures of which the cornea is composed at the same time ; and though, in many instances, it may be difficult to discriminate the precise extent of the disease, yet, in others, it may clearly be shewn, that the inflammation is entirely confined to one of the textures.

As this distinction involves very important consequences, both in a pathological and practical point of view, I shall consider inflammation of the cornea under three separate heads :—

First, As affecting the conjunctiva, which covers the cornea.

Secondly, As confined to the proper substance of the cornea ; and,

Thirdly, As affecting the membrane which lines the internal surface of the cornea, or Capsule of the Aqueous Humour.

1. *Of Inflammation of the Conjunctiva of the Cornea.*

It is by no means unusual to observe, in those who have had long or repeated attacks of inflammation of the conjunctiva covering the sclerotic coat, a considerable degree of obscurity and vascularity extending over the cornea. This took place in many of our troops who suffered from the puriform ophthalmia in Egypt, and who have, since their return home, been subject to frequent inflammatory attacks in their eyes. Many cases have also occurred where the same effect was produced by the ophthalmia which has since been so frequent in this country. The obscurity of the cornea, in the cases to which I allude, appeared to be confined to its external surface. Red vessels became ramified upon it, and they were much more numerous, in proportion to the degree of opacity, than they ever are in

speck of the cornea. I have observed, in a variety of cases of ophthalmia in this country, where the conjunctiva covering the sclerotic coat was attacked with inflammation, that red vessels branched out from a particular portion of the affected part, and extended a little way over the edge of the cornea; but these vessels generally disappeared when the more violent inflammatory symptoms were subdued. In all these cases, however, the inflammation commenced and extended from the sclerotic conjunctiva to that part of it which covers the cornea.

But, in other instances, the inflammation first appears in the conjunctiva covering the cornea, and is almost entirely confined to it alone. When this takes place, it very much resembles a *Speck*, on a superficial examination; but the commencement, progress, and final termination of the two diseases are very different.

Inflammation of the Conjunctiva of the Cornea begins at the circumference, and

gradually extends over the surface of the cornea, whereas a Speck commonly commences at the centre of the cornea, or at some distance from its circumference, spreading in every direction from that point. In the inflammation of the conjunctiva covering the cornea, the opaque part becomes elevated above the natural surface of the cornea, and is highly vascular; whereas, in speck, the form of the cornea remains unaltered; and, although one or more vascular trunks advance to the speck, yet the distribution of their branches becomes in general imperceptible.

Inflammation of the conjunctiva of the cornea may also be mistaken for a *Pustule* of that membrane; for, in the latter disease, the conjunctiva adjacent to the pustule is sometimes distinctly vascular, and elevated above its natural surface. But if the progress of the two affections be attentively observed, they will be found to differ, for a pustule of the cornea, like a speck, begins at one point,

extends from it as a centre, and very frequently terminates in an ulcer. *

The most remarkable symptom of Inflammation of the external lamina of the cornea, is the appearance of an elevated and whitish coloured spot or streak, at some point near the union of the cornea with the sclerotic coat; accompanied by a greater or less degree of inflammation of the adjacent conjunctiva. The blood-vessels in the inflamed part are of a bright scarlet colour, run in a straight direction, and are most numerous towards the diseased spot, some of them being ramified through it. This opaque spot gradually extends across the cornea, acquiring, as it proceeds, an oblong form, with a rounded obtuse point. It continues elevated above the natural surface, is distinctly defined, and remains nearly of the same breadth till it reaches the centre of the cornea. If it passes beyond this, it becomes broader, and the breadth increases as it extends, but

* See Ulcer of the Cornea.

I have never, in any instance, observed it pass as far as the opposite edge of the cornea. The degree of vascularity also increases in proportion as this spot becomes larger; and if a magnifying glass be used, the whole of the diseased part will be seen crowded with red vessels. *

When the inflammatory symptoms abate, and the progress of the complaint is checked, the vessels distributed on the diseased portion of conjunctiva acquire a purplish colour, gradually diminish both in size and number, and run in a tortuous direction. The elevation of the membrane subsides, and if the inflammation has neither been very violent, nor of long duration, its transparency is completely restored. But this is not always the manner in which it terminates, as a degree of obscurity sometimes remains after all the inflammatory symptoms and appearances of vascularity have abated. In other instances there is both a slight degree of obscurity, and

* Compare fig. 2. Plate I. and fig. 1. Plate II.

some red vessels. In one case, where the accompanying inflammation was very violent, the diseased portion of conjunctiva separated completely from the subjacent cornea, and came off in the form of an opaque slough, leaving a slight degree of obscurity in that part of the cornea on which it had been situated.

After the eye has been once affected with this disease, it is very liable to subsequent attacks; and although the cornea regains its transparency, and the red vessels disappear, yet every fresh inflammation is more obstinate than the former, a larger portion of conjunctiva becomes inflamed, and even after the inflammatory symptoms disappear, the conjunctiva remains interwoven with varicose vessels, flaccid and opaque, having the appearance of a new formed membrane. *

Most of the cases of this disease which I have had an opportunity of observing have been in children. In one instance, however, it occurred in a lady nineteen years

* Vide Pterygium, Chap. III.

old. I have seen another remarkable example of this disease in a strong healthy man, about thirty-five years of age. In this instance it was accompanied with very violent inflammatory symptoms; and although the whole of the corneal substance had, from the commencement of the disease, become cloudy, yet the patient himself, by examining daily his eye at a glass, gave a very accurate account of the progress of the opacity of the conjunctiva covering the cornea, describing it as beginning at the edge of the cornea, and extending gradually to past its centre. When I saw him, all the inflammatory symptoms had disappeared, the substance of the cornea had regained its transparency, and the affected portion of the corneal conjunctiva remained thickened, of a brownish colour, and interwoven with blood-vessels, the trunks of which were formed into a cluster, at the union of the cornea with the sclerotic coat.

2. *Of Inflammation of the Proper Substance of the Cornea.*

If the whole of the proper substance of the cornea be inflamed, the red vessels enter at every part of its circumference. They are always most numerous at the margin, and few of them advance to the centre. I have seen them so numerous, as to form a red band or ring round the outer edge, leaving the central part transparent. If the inflammation be confined to one spot, the red vessels appear in clusters on the adjacent portions, both of the cornea and sclerotic coat.

From the commencement of the inflammation, the cornea loses its transparency and lustre, and becomes so dim and clouded, as greatly to interrupt vision. There is either an equal degree of obscurity over the whole cornea, or one part is more opaque than another; but the degree is, in general, proportioned to the severity of the other symptoms.

When the inflammation is extremely violent, I have seen small vesicles, filled with red blood, formed between the layers of the cornea; and in some cases blood effused into the aqueous humour, tinging it of a red colour.

In the first, or active stage of the inflammation, the blood-vessels on the sclerotic coat are of a bright scarlet colour. They run in a very straight direction, and pass over the edge of the cornea. Each trunk can be readily distinguished, and the branches into which it is divided come off at very acute angles, and not until the trunk reaches the circumference of the cornea.

Inflammation of the cornea is accompanied by more or less general fever, pain in the eye, extending to the head, intolerance of light, increased secretion of tears, and impaired vision.

Although inflammation may originate in the cornea, it is always accompanied with a preternatural degree of redness of the sclerotic coat; and it is often impossible to determine whether the cornea or sclerotic coat is pri-

marily affected. In cases where the cornea is wounded, it cannot be doubted, that the inflammation originates in the wounded part, however far it may afterwards extend; but, in many instances, both the cornea and sclerotic coat seem to have an equal share in the disease. It is probable that this ready communication of diseased action between these two coats, depends chiefly on their vascular connection; for the vessels of the substance of the cornea are all derived from the sclerotic coat, and, as has been before mentioned, those of the conjunctiva covering the cornea, are continuations of the vessels of the conjunctiva covering the sclerotic coat.

The symptoms of Inflammation of the Cornea generally suffer, whether by the application of remedies, or from the progress of the disease, a very remarkable change after a certain period. The red vessels of the sclerotic coat and cornea increase in size and in number, change in colour, and are distributed in a different manner. Instead of run-

ning in straight lines, and sending off their branches at acute angles, they become tortuous, anastomose, and form net-works. The bright colour changes into a darker and more purple hue, and the eye appears as if glazed, losing all its lustre and expression. The pain, too, and general fever, which were severe, are now alleviated, or cease altogether, and the free admission of light is not attended with much uneasiness. If the inflammation has been occasioned by an wound, such as that which is made for the extraction of a cataract, this change generally takes place in twelve or fourteen days after the operation. The change approaches more slowly in those cases where inflammation arises from other causes, and rarely happens till after a period of some weeks, or even months, from its commencement. In many cases, indeed, no such distinction can be made, as, throughout the whole progress of the disease, there is a constant change taking place in the abatement or increase of all the symptoms.

I have seen a few cases where there were a number of varicose vessels in the cornea, in consequence of previous inflammation; and the patients, in describing the state of their vision, said they saw small lines, or streaks, passing across the eye, which they sometimes observed to vary in their size, and to have a kind of irregular vermicular motion, such as the blood-vessels in the cornea may be supposed to have.

If an attempt be made to divide the enlarged vessels as they pass over the cornea, a dangerous practice sometimes employed in the treatment of the disease, they are found to lie deep, and they cannot be so easily raised from the cornea or sclerotic coat with the forceps, or elevated by a pointed instrument, as may be done when the corneal conjunctiva has been inflamed. In order to complete the division of one of these vessels, it becomes necessary to remove a considerable portion of the substance of the cornea, or sclerotic coat. Soon after such an operation has been performed, lymph is effused

on the surface of the wound; and it often happens, that vessels shoot through this lymph, forming a medium of communication between the divided extremities; so that after the effects of the operation seem to have abated, the vessel remains in one continued trunk, and appears as if no division had been made. In other cases, the minute ramifications of the divided vessel which remain, anastomose on the cornea, so that red blood continues to be circulated through the trunk.

Inflammation of the cornea occurs at every period of life, and, like other inflammatory affections, is most frequent among the young and plethoric. It most frequently arises from wounds and other external causes; as when pieces of stone or melted iron are imbedded in it. But the cornea is also often inflamed in cases of ophthalmia arising from small-pox, scrofula, and various eruptive diseases; the inflammation being, in all those cases, modified according to the specific cause from which it originated.

Inflammation of the cornea, when proper means are employed for its removal, most frequently terminates by the disappearance of all its symptoms. Sometimes, however, during the progress of violent inflammation, purulent matter is formed between the lamellæ of the cornea, which, by ulceration, either discharges itself internally into the anterior chamber, or externally, leaving an ulcer of the cornea. More frequently, after all the inflammatory symptoms have disappeared, a part of the cornea does not regain its natural transparency, so that a *Speck* remains, nourished by one or more red vessels.

3. *Of Inflammation of the Membrane which lines the Internal Surface of the Cornea.*

Although, from analogy, it is highly probable that the portion of the capsule of the aqueous humour which lines the internal surface of the cornea may be inflamed, and the inflammation neither affect the proper

substance of the cornea, nor its external covering; yet I have never been able to observe an instance with sufficient accuracy where this took place. In cases of venereal ophthalmia, there is often a peculiar muddiness of the cornea, apparently deep-seated, followed by the effusion of lymph between the cornea and iris; and it is by no means improbable that, in these cases, the lymph has been effused, and the opacity of the cornea produced by the inflammation of its internal membrane. I have also frequently observed cases where the iris and internal surface of the cornea had formed adhesions, in which the substance of the cornea did not appear to have been inflamed. The inflammation, or at least some of the morbid changes of the internal lamina, may also be concerned in the cases where the quantity of the aqueous humour is either increased or diminished; and it must often participate in the inflammation which originates in the proper substance, or in the external covering of the cornea.*

* The inflammation of the Capsule of the Aqueous Humour is fully described in Chap. XV. Vol. II.

CHAP. III.

OF THE PTERYGIUM.

THE word *Pterygium** is employed to denote all those morbid changes, in which that portion of the conjunctiva covering any part of the cornea or sclerotic coat becomes thickened, vascular, and opaque; and some authors have attempted to introduce a number of terms to characterize the different varieties of the disease, considering each as a distinct species.†

* Eye-wing,—Das Augenfell of the Germans,—L'Ongle of the French.

† Traité sur les Maladies de l'Oeil, par Antoine Maitre-Jan. —Also Anfangsgründe der Wundarzneykunst, von August Gottlieb Richter. Dritter Band.

It has already been mentioned, that inflammation may be confined to the conjunctiva covering the cornea. If this inflammation continues for a long time, or if there are repeated attacks of it, the affected portion of conjunctiva assumes the appearances of a new formed membrane, even after all the inflammatory symptoms have abated. This new formed membrane constitutes what has commonly been denominated the Membranous Pterygium, or *Pannus.**

It also sometimes happens, that the portion of conjunctiva which covers the sclerotic coat becomes preternaturally thick, and the cellular membrane which connects the thickened part with the sclerotic coat, is so much relaxed, that it may very easily be moved backwards and forwards; and when the eye-ball is placed in particular positions, it forms itself into folds, and becomes as if wrinkled. This thickening and relaxation of the conjunctiva extends, in some cases,

* Pterygium tenue, Ungula, l'Onglet, see Plate III. fig. 1.

round the whole circumference of the white of the eye,* in others, it is confined to a small part of it.

In the first case, the disease has the appearance of a dull white-coloured fold, all round the edge of the cornea, and the eye loses its shining appearance and lustre, and becomes of a yellowish colour. When the disease increases, the fold gradually extends over the cornea, approaching towards the centre.

If the disease be confined to a particular part of the conjunctiva, it is observed, at its commencement, like a small globule of fat,† or condensed cellular substance, situated, most frequently, near the junction of the cornea and sclerotic coat; and this spot, extending imperceptibly along the surface of the conjunctiva, at length passes over the cornea. After it has extended a little way, the conjunctiva on the adjoining part of the sclerotic coat becomes puckered, and ap-

* Richter's Anfangsgründe.

† Das Fettfell of the Germans,—Pterygium pingue.

pears as if it were forcibly drawn over the cornea. The portion of it which lies on the sclerotic coat is commonly loose, and can be easily elevated; but that which is on the cornea adheres more firmly. This species of pterygium has generally a triangular form, * one of the angles of the triangle either advancing towards the cornea, or covering a portion of it, and the base lying on the sclerotic coat. Sometimes the thickening of the conjunctiva is first perceived on the cornea, the conjunctiva covering the sclerotic coat remaining quite sound. †

A pterygium is always considerably elevated above the surface of the adjacent cornea, but the degree of its thickness varies from that of a thin membranous film to a thick fleshy mass. ‡ In some cases it has been found thick and coriaceous, and in others as hard as parchment, and even cartilaginous. §

* See Plate III. fig. 2.

† Richter's Anfangsgründe.

‡ See Plate III. fig. 1, 2, and 3.

§ Richter's Anfangsgründe.

The cellular substance under the conjunctiva sometimes participates in this disease; in other instances it does not seem to be affected.

In one case, a small bladder, containing a pellucid fluid, was observed in the middle part of a pterygium.

In those Pterygia which have a membranous-like appearance, the red vessels are generally few in number, and run in straight lines from the sclerotic coat towards the centre of the cornea. In those which are thicker, and which have a fleshy appearance, there is a general red tinge given, from the vessels being very numerous.

Pterygia arise commonly at the great or nasal angle of the eye-ball; they are also formed at the temporal angle, and they sometimes occur at both places, in the same eye. * I have seen one case in which there were two pterygia on each eye. They are formed very rarely on the upper and under parts of the eye-ball.

This disease seldom extends farther than

* Traité Pratique des Maladies des Yeux, par A. Scarpa.

the centre of the cornea, when it begins in a single point. But when two Pterygia arise from opposite points of the same eye, they sometimes spread over the cornea till they nearly meet, and then form a complete obstruction to vision; the imperfection of vision in this disease being in proportion to the thickness of the pterygium, and to its approximation to the pupil.

When a Pterygium arises in the nasal angle of the eye, it seems almost always to attach itself to the semilunar membrane, and in many cases it also adheres to, and involves the lacrymal caruncle.

Pterygia occur most frequently in people advanced in life. They are, however, also met with in children: And I have seen one instance in which the disease was observed immediately after birth.

Many have supposed that the Pterygium was a particular kind of expansion or growth from the lacrymal caruncle, or from the semilunar membrane; but from the variety in its appearances, and from observations

on the progress of the disease, it would seem that its connection with these parts is accidental; and that pterygia arise from a variety of causes, some of which we are, perhaps, not able satisfactorily to explain.

It has already been mentioned, that the thin Membranous Pterygium is the consequence of repeated attacks of inflammation of the conjunctiva covering the cornea.

The manner in which the common Triangular-shaped Pterygium is formed is much more singular, and appears to have no analogy to any morbid change in other organs which have a similar structure. The constancy in the regularity of its triangular form ought to be referred, says Scarpa, the celebrated Professor of Pavia, to the adhesion of the lamina of the conjunctiva covering the cornea becoming stronger, in proportion as it advances from the circumference to the centre of the cornea; for, in consequence of such structure, and different degree of cohesion which exists in the sound eye, it should necessarily follow, that the progress of the

pterygium ought to be, in every case of the disease, much slower upon the cornea than upon the white of the eye; and that, from the greater resistance which the pterygium always meets with in proportion as it extends towards the centre of the cornea, it ought, from mechanical necessity, to assume a triangular form, the base of the triangle corresponding to the white of the eye, and the apex to the centre of the cornea.

The progress of a Pterygium is, in almost every case, very slow; it arises without any evident cause, and gradually increases, without pain or inconvenience, until it acquires a considerable bulk, and encroaches on the sphere of the pupil. In many instances, it remains for years without undergoing any perceptible alteration.

CHAP. IV.

OF FLESHY EXCRESCENCES OF THE CORNEA.

Besides pterygia there are excrescences of a different description, which are called *Caruncles*,* or Fleshy Excrescences of the cornea. Of these there are three distinct kinds. One species appears at birth, or soon after it, and resembles the nævi materni so frequent on the skin of various parts of the body. The second species has a greater analogy to the fungi which grow from mucous surfaces; and the third commonly arises after ulceration of the cornea.

* Carunculæ Corneæ,—Excroissances des Chairs, of the French,—Fleishgewächse of the Germans.

I have had an opportunity of examining two very remarkable examples of tumours of the cornea, which appeared at birth. The first was that of a girl, on whose left eye there was a conical-shaped mass, the base of which grew from about two-thirds of the cornea, and a small portion of the adjoining sclerotic coat. It was firm and immoveable, had a rough granulated appearance externally, and, from its brownish colour, did not appear to be very vascular. It was small when first observed, and it increased in size in proportion with the other parts of the body.

The second case was shown to me by Dr Monro. The patient was upwards of fifty years old, and the tumour had been observed from birth. It was about the bulk of a horse bean, only a small portion of it adhered, and seemed to grow from the cornea; the other part was situated on the white of the eye, next the temporal angle of the orbit. Its surface had not the granulated appearance of the tumor in the girl's eye;

it was smooth like a pterygium, and seemed to be covered by the conjunctiva, having the natural colour of that membrane. But the singularity in this case was, that a considerable number of very long and strong hairs, upwards of twelve in number, grew from its middle, passed through between the eye-lids, and hung over the cheek. The patient remarked that these hairs did not appear until he had advanced to his sixteenth year, at which time also his beard grew. *

Dr Barron of Gloucester saw a similar case: "The disease took place in a boy fifteen years of age. It was a flat tumour, about one-third of an inch in diameter, with a circular base. More than one-half of it was situated on the cornea, and the rest on the conjunctiva, adjoining to the temporal angle of the orbit. Its surface was smooth and shining, and from its centre grew two hairs, similar to those of the tarsus. In colour it resembled the white part of the conjunctiva."

* See Plate IV. fig. 3.

De Gazelles saw a case where there was a single hair growing from the cornea.*

I have in my possession a preparation of a disease of this kind in an ox's eye, where a thick tuft of black hair has grown from one-third of the cornea, and some hairs also from the semilunar membrane. A similar excrescence was formed in the other eye of this animal.

Such tumours greatly resemble those spots covered with hair, which are so frequent in different parts of the surface of the body, particularly the face. I remember to have seen the description of a very curious case, where a tumour, covered with hair, appeared in the pharynx of a child.

Tumours of the second species, or those arising from a diseased state of the corneal conjunctiva, are but rarely met with. Two different tumours of this description are represented in the plates. †

In one the growth which covered one-

* See Journal de Medecine, Tom. xxiv,

† See Plate IV. fig. 1 and 2.

half of the corneal surface had an irregular form, and a firm granulated texture; in the other the tumour, which also covered a large portion of cornea, had an unequal surface, was of a peculiar dark brown colour, and of a soft texture.

Voigtel* quotes the case of a boy from Mohrenheim, in whom, after a violent inflammation of the eye, a small white point appeared on the inferior part of the cornea, which gradually grew into a hard cartilaginous tumour, of the bulk of a pea. Its base covered one-half of the cornea, and its surface was interwoven with large blood-vessels.

Beer† describes a fatty and fleshy swelling of the cornea which was as large as a cherry-stone; and Plaichner‡ relates a case, where "a spongy tumour, the size of a hen's egg, grew from the cornea, after the removal of a fleshy swelling."

* See Handbuch der pathologischen Anatomie, von F. G. Voigtel. Halle, 1804.

† Practische Beobachtungen über den grauen Staar und die Krankheiten der Hornhaut, von Joseph Beer. Vienna, 1791.

‡ Dissertatio de Fungo Oculi, 1780.

A fungous tumour, arising from the surface of an ulcer on the cornea, is a rare disease. It, however, frequently happens, that an ulcer destroys the whole thickness of the cornea, allowing a portion of iris to protrude, and the protruded portion has, in many cases, been the origin of large excrescences. "The largest excrescence I ever saw," says Maitre-Jan,* "arose from an ulcer which occupied partly the opaque, and partly the transparent cornea. It was so large as to advance beyond the eye-lids, like a mushroom, and cover the whole eye-ball." After mentioning the means employed to remove it, he adds, "when the excrescence was consumed to the level of the cornea, I then observed, that its base only occupied one-half of the small angle; that the cornea was ulcerated and broken; and that the roots of the excrescence passed from thence, and had their attachment to the uvea."

* Traité des Maladies des Yeux.

CHAP. V.

OF PUSTULES. *

PUSTULES are small tumours, which are formed on the conjunctiva, both of the cornea and sclerotic coat, but they occur most frequently at the junction of these membranes.

A pustule commonly first appears like a dusky yellow, or reddish spot, a little elevated above the surface of the cornea, and, in a short time, it becomes a distinct conical tumour.

The adjacent part of the cornea is always

* They are called Pustulæ Corneæ,—Eiterbläschen by the Germans, when they contain matter,—Phlyctenæ Corneæ,—Phlyctides,—Wasserbläschen, when they contain water.—Bothor of the Arabians.

more or less dim, and a considerable degree of inflammation * accompanies it, which is either confined to the white of the eye contiguous to the pustule, or is spread over the eye-ball.

Whilst the Pustule is forming, the inflammation is generally confined to that part of the white of the eye which is in its immediate vicinity. The blood-vessels, instead of being of a bright scarlet colour, as in the inflamed cornea, are of a pale livid hue. They appear superficial, and can readily be elevated by a pointed instrument. Each trunk can be distinguished, for they are never so numerous as to appear confused, or like one red mass, an appearance so common when a portion of the conjunctiva is inflamed. † They sometimes run in various directions, and anastomose freely with one another, forming net-works upon the white of the eye.

If the inflammation and Pustule remain for

* Ophthalmia Pustulosa, Ophthalmie Bourgeonée.

† See Plate I. fig. 3.

some time, the pustule generally advances to suppuration. When suppuration takes place, the apex of the pustule ulcerates, and frequently a chalky white spot appears at the centre of the ulceration, and the opacity of the cornea at the same time daily increases around it. In other cases the opaque matter separates, and leaves behind it a deep ulcerated excavation. *

Sometimes the suppuration proceeds more like a common pimple or phlegmon of the skin; a small quantity of a thick matter collects within the pustule, and when it is discharged, a conical tumour remains, which has a depression at the apex. †

When the Pustule contains a watery fluid, the fluid is most frequently absorbed in a gradual manner, but at other times the pustule breaks, and an ulcer is formed.

I observed in a young man who had been some months liable to a dulness of the anterior chamber, that in two or three places of the cornea, there were distinct blisters or

* See Ulcer of the Cornea. † See Plate V. fig. 1.

vesications of its external layer, which disappeared in a few days. Similar cases are not unusual.

When the contents of a pustule are artificially discharged, all the accompanying inflammatory symptoms are much increased. *

When the ulceration of a pustule has taken place, besides the ulcerated surface, there is more or less obscurity of the surrounding cornea, which goes away as the ulcer heals. There is also a cluster of blood-vessels generally seen passing along the cornea to the ulcer, which appears to be an increased vascularity of the mucous covering of the cornea. These also gradually vanish, whilst the ulcer is healing.

Most frequently there is only one pustule, and only one eye affected, but in some cases there are several pustules, both on the cornea and sclerotic coat of each eye.

The disease, at its commencement, is almost invariably accompanied with the sen-

* Vide Richter's Anfangsgründe.

sation of a mote in the eye, and the whole conjunctiva covering the sclerotic coat has often a yellowish and shining glassy colour before the redness appears. There is often also a degree of redness and swelling, chiefly of the upper eye-lid, and the tarsi are found adhering together in the morning from the exudation of a yellow matter among the ciliæ. There is frequently an unusual dryness felt in the eye; but if it be exposed to a bright light, or any attempt made to use it, the secretion of tears is increased.

This species of inflammation is always accompanied with a much greater degree of general fever, in proportion to the severity of the other symptoms, than most other forms of ophthalmia. The pain is rarely acute till the pustule ulcerates, but, if that takes place, it is commonly very severe.

As the pustule disappears, and the subsequent ulcer heals, the inflammatory symptoms generally abate. It is not, however, unfrequent to find, that, although this has taken place, the inflammation returns on any

slight irritation; and I have known many instances of persons who have been subject to repeated attacks of this disease. In some cases, where proper remedies are not employed, one pustule succeeds another, so that, during many months, or even years, the eye is never altogether free from inflammation. In some of these cases where they return frequently, the pustules seldom ulcerate, but disappear gradually, after having remained a few days, or sometimes a much longer period.

I have seen several instances of this disease, where, besides the Pustule, a small quantity of puriform matter formed in the anterior chamber. It was readily distinguished by its yellow colour at the inferior margin of the cornea, and it diminished daily as the inflammation abated. In these cases it sometimes happens that the matter, along with the aqueous humour, is evacuated by the cornea ulcerating, immediately after which the inflammatory symptoms rapidly subside.

Pustules of the cornea are met with in persons of all ages, but they are more common in the young than those advanced in life.

This disease appears to be most frequent in particular places, and in particular seasons of the year. I have generally observed it in the winter months; and in several cases, I have been able to trace its origin to the sudden change from a very warm to a cold atmosphere. At one of the theatres of Vienna, where a cold stream of air passed from behind the stage, over the orchestra, Beer observed, that those who were placed near it were very often affected with this complaint.

It appears to me that these Pustules very much resemble *Aphthæ*, which are so frequently met with in the cavity of the mouth, on the tongue, lips, internal surface of the alimentary canal, and other mucous surfaces; and it is not improbable that the disease arises from inflammation of the mucous glands.

As some remarks of Professor Himly il-

lustrate very strikingly this analogy, I shall finish the account of this disease, by quoting his words: " At a time, when Aphthæ of the throat were very frequent at this place, I also found many vesicles, beginning with an inflammation of the sclerotic coat, and also sometimes, but more rarely, of the cornea. Once I saw a whole family affected with this disease, one after another. It was a true catarrhal affection, and in some cases these vesicles disappeared by diaphoretic medicines, in some by blisters, camphor, and antimony, without any local application, except mucilaginous ones. I think that it is just the same disease as Aphthæ of the intestinal canal, of the corona of the glans penis, and other fine continuations of the external skin." *

* See Bemerkungen über einige Augenkrankheiten, von Professor Himly zu Braunschweig, p. 402 of the 1st volume of Loder's Journal.

CHAP. VI.

OF THE ABSCESS OF THE CORNEA AND ANTERIOR CHAMBER.

A PURIFORM matter may either be effused between the laminæ of the cornea, when the disease is termed *Unguis* or *Onyx*, or in the anterior chamber, along with the aqueous humour, when it is called *Hypopion* or *Empyesis oculi.** This fluid, which has generally been denominated matter, is probably albumen, such as is observed to be effused in other serous cavities during inflammation, and which, as in these, varies in consistence, colour, and other qualities. †

When the matter is effused between the

* Die Eyterung des Auges,—Der Hornhaut Apostem.

† Scarpa, Malattie degli occlis.

laminæ of the cornea, it first appears like a small spot; and instead of resembling a *Speck* in colour, it is of the yellow hue of common pus. As the quantity of matter increases, this spot becomes broader, and it does not alter its situation from the position of the head. If it be situated among the external laminæ of the cornea, or immediately below the corneal conjunctiva, a tumour is formed anteriorly, which, if touched with the point of a probe, the contained fluid can be felt fluctuating within it, or if the eye be looked at side-ways, there is readily perceived an alteration in the form of the cornea.

When the matter is effused between the interior laminæ, it does not produce any evident alteration in the external form of the cornea, but if it be touched with the point of a probe, a fluctuation can be more or less distinctly perceived, and the spot alters its form, and becomes somewhat broader. *

Such collections of matter appear on every part of the cornea. Sometimes they alter their situation by degrees, and sink down-

* See Plate VI.

wards; and sometimes they change both their situation and form.

They very seldom cover more than one-fourth or one-third of the cornea: in one instance, I saw the matter so extensive, as to be spread over nearly the whole cornea.

If the quantity of matter be small, it is often completely absorbed during the abatement of the inflammatory symptoms, and generally no vestige of it is left: In other cases, the cornea is eroded externally, producing an ulcer and subsequent opacity. * In some few instances, the internal lamina of the cornea gives way, and the matter escapes into the anterior chamber. In others, the ulceration is so extensive as to destroy the whole thickness of the cornea, and allow the matter to escape.

If an artificial opening be made, in order to discharge the matter, it often does not flow out readily; and it is sometimes so tenacious, and contained in a cavity apparently so irregular, that it neither escapes

* See Ulcer of the Cornea, Chap. VII.

spontaneously, nor can it be evacuated by art.

When matter is collected in the anterior chamber, it usually appears like a small yellow globule between the iris and cornea; and as its specific gravity is greater than that of the aqueous humour, it generally occupies the inferior part of the cavity.* In some cases I have observed the matter appearing like small opaque flocculi diffused through the aqueous humour, and these, by gradually uniting, formed a drop, which sunk to the inferior part of the cornea.

As the quantity of matter increases, the spot becomes larger, and often assumes a semilunar form at the edge of the cornea.

Sometimes the matter collects in so large a quantity as to pass through the pupil, and fall behind the iris. When this happens, the cornea generally becomes not only opaque, but also loses its natural firmness of texture; and in some very far advanced cases of the disease, when attempting to discharge the matter, I have found

* Richter's Anfangsgründe.

the cornea quite soft, and easily torn to pieces.

Unless when in great quantity, the matter is generally absorbed in proportion as the inflammatory symptoms are alleviated; but if it remains a long time, it sometimes ulcerates the cornea, or becomes inspissated into a tough, light-coloured mass, which remains after all inflammatory symptoms have disappeared.

Schiegel mentions a case of hypopion, where, " by the application of an emollient decoction, the matter discharged itself in an uncommon manner. Whilst using it, the fine pores of the cornea opened, and the matter oozed out in the form of delicate threads. On the second day the distended cornea was considerably flatter, the oozing out of the matter continued without interruption, and in four days nearly two drams of matter had passed through the pores." *

* Vide Magazin für die Wundarzneiwissenschaft herausgegeben, von J. Arneman, 2d Band. 2d Stück.

Abscesses of the cornea and anterior chamber are commonly the effect of violent ophthalmia, occasioned by injuries of the eyeball, as well as of specific diseases. Richter remarks, that matter sometimes collects in venereal and scrofulous patients, without any preceding inflammatory symptoms.

Dr Rutherford related to me the case of a woman who had a very considerable collection of matter in the anterior chamber, accompanied with very little or no inflammation. The matter altered its form and place, according to the position of the head, and, during the day, the agitation of the body, produced from walking, mixed the matter with the aqueous humour, and rendered the whole anterior chamber turbid.

Janin relates a very curious case of Hypopion, where there was not only the absence of the inflammatory symptoms, but where the disease recurred periodically. " Peter Valis consulted me about a periodical blindness with which he had been affected for twelve

months, during the first fifteen days of every month; and, after that time had elapsed, his eyes were restored to their natural state. I examined the organ, in order to ascertain the cause of that singular kind of blindness, and I observed that the anterior chamber of both eyes was filled with a yellow-coloured matter, so thick as neither to allow the colour of the iris, nor the state of the pupil, to be seen through it. The most remarkable circumstance in this case was, that the conjunctiva was very little inflamed, and the eye not painful."*

Richter saw a man who was blind every morning, and it was always remarked that, while the paroxysm lasted, the aqueous humour was quite turbid.

It has been a subject of dispute, to account for the source of the matter which is formed in Hypopion. It appears probable, that as there is no ulcerated surface from which it can be derived, it is the pro-

* Vide Memoires sur l'Oeil, par Janin, p. 412.

duce of a secreting organ. There are numerous examples of the natural secretion of surfaces being altered by diseases. It is very remarkable in inflammation of the mucous membranes, and also in the Pleura, Pericardium, and others of the serous class, to which the membrane which contains and exhales the aqueous humour belongs. When these are inflamed, it is a very common morbid appearance to observe their surfaces covered with a matter, varying from the consistence of thick coagulated albumen to that of a thin yellow puriform fluid.

CHAP. VII.

OF ULCERS OF THE CORNEA. *

ULCERS on the cornea have been divided by some authors into a number of species, from differences in their size,—in their duration,—in the degree of the severity of the accompanying symptoms,—and from the various causes from which they have been supposed to originate. But as these divisions are not founded on any specific differences in the nature of the disease, and as, instead of elucidating the subject, they lead to erroneous conclusions, and render more complex a

* Helcoma.—Das Geschwür der Hornhaut.

subject in itself simple, I shall omit mentioning them, referring those who wish for information on this subject to the works of Wallis,* Maitre-Jan, Mauchart,† and Rowley.‡

The most frequent variety of Ulcer is that which remains after the cornea has suppurated and burst, either in consequence of a pustule or abscess.

When a Pustule suppurates, the central part generally first gives way, and, as the disease continues, the ulceration extends in all directions from that point. Ulcers of this kind are generally circular, and the edges rounded and smooth, having sometimes the appearance of a small artificial dimple.§ In other instances, they have an

* A Treatise on the Diseases of the Eye, by George Wallis, M. D. 1785.

† Burcard, David Mauchart, *De Ulceribus Corneæ*. Tubingæ, 1742.

‡ A Treatise on the Diseases of the Eye and Eyelids, by William Rowley, M. D. 1790.

§ See Plate V. fig. 1.

irregular shape, and their edges are jagged and acute.

The size of Ulcers is very various; in some cases they do not appear larger than a depression made by the point of a pin; whilst in others they cover a much larger portion of cornea. In a boy I saw an Ulcer, which covered at least one-third of the central part of the cornea. It seldom, however, happens that they spread over a large surface, for those of the most malignant kind are more apt to increase in depth than in breadth.

Ulcers are generally superficial, and do not extend deeper than the external lamella; at other times, they penetrate the whole thickness of the cornea, allow the aqueous humour to escape, and the iris to protrude.

Most frequently the part of the cornea contiguous to the ulcer becomes more or less obscure; and in some cases red vessels may be traced in it. It is not unusual, however, to observe a small ulcer without any perceptible obscurity of the cornea.

The surface of an ulcer sometimes retains the natural transparency of the cornea; and sometimes it has a dull unclean appearance, which will be observed to go away, and the surface become transparent when the ulcer begins to heal.

In some violent cases, where the ulceration spreads with great rapidity, the cornea loses not only its transparency, but its tenacity and firmness, and becomes like a piece of wet paper separating in the form of sloughs.

Ulcers often penetrate the whole thickness of the cornea, leaving entire the interior lamina, or capsule of the acqueous humour, which protrudes through the ulcer in the form of a small transparent and prominent vesicle. This affords an additional illustration of the structure of the cornea. I have remarked the same phenomenon in the progress of ulceration of other parts composed of different textures, the ulcerative process being limited to one or more of these structures. I have observed the whole

hernial sac and adjacent cellular membrane destroyed by suppuration, and the intestine remain uninjured. Extensive suppurations often take place around arteries, destroying the cellular membrane, but leaving the coats of the artery untouched.

When the aqueous humour is discharged, from the whole thickness of the cornea being destroyed, the iris sometimes falls forwards, comes in contact with the cornea, and, in many cases, a portion of it is insinuated through the opening made by the ulcer. If the ulcer heals speedily, and the aqueous humour is regenerated, the iris sometimes resumes its natural situation; but more frequently an adhesion takes place between the iris and cornea, so that ever afterwards the pupil remains drawn from its natural situation, and of an irregular form. Sometimes the ulcer is tedious in healing, so that the aqueous humour continues constantly to ooze through it, and thus a *fistula* of the cornea is formed.

In many instances where an ulcer has

penetrated the anterior chamber, the ulcerated orifice is closed by a thin delicate and transparent membrane, which occasionally gives way, allowing the aqueous humour to escape, and the opening appears like a small dark puncture. In such cases the eye-ball usually feels softer than natural.*

In cases where a great portion of cornea is destroyed by ulceration, not only the aqueous, but also the vitreous humour and crystalline lens make their escape, completely destroying the eye-ball.

In a woman, in whom, by a violent attack of inflammation, the cornea was destroyed and came off in large sloughs, a transparent tumour formed by a prolapsus of the vitreous humour through the opening of the cornea. She was thus enabled to see with considerable distinctness for several days, until the vitreous humour began to be absorbed, and the eye-ball to collapse. A man had a cancerous sore on the under eye-

* See Plate VIII. fig. 1.

lid, which, in spreading, inflamed the eye-ball, and ulcerated nearly the whole cornea. Through this ulcer a portion of vitreous humour was pushed, forming a large transparent tumour, which enabled him, for several days, to distinguish minute objects with tolerable distinctness.

Ulcers are seldom accompanied with much swelling of the cornea, except in children, in whom I have sometimes observed the cornea all round the ulcer considerably tumefied.*

Ulcers are generally attended with acute pain, which is much aggravated by exposure to light, or even by the most careful motion of the eye-lids. I recollect having seen only one instance, of an ulcer of considerable size and depth, attended with little pain or uneasiness.

Ulcers, such as have been described, have a striking analogy to those which form on mucous surfaces, or on those parts of the body where the skin is very thin and inflect-

* See Plate V. fig. 1.

ed inwards,* as on the mouth, lips, internal surface of the nose, tip of the tongue, &c. The pustules or aphthæ † which precede these, have the same tendency to ulcerate rather than form matter; they discharge an acrid serum instead of pus; they spread rapidly, and are attended with acute pain.

Ulcers sometimes, though rarely, take place after wounds of the cornea.

Ulcers are also formed in consequence of the action of corrosive substances destroying the vitality of the cornea, producing an ulcer being produced where the dead portion was separated from the living. Lime getting into the eye is the most frequent accident which produces this effect; but the application of the nitrate of silver, muriate of antimony, &c. produces one nearly similar.

When lime falls within the eye-lids, those parts of the surface of the cornea to which it is applied, become covered with an opaque white scale, accompanied by inflammation

* Vide Scarpa Mallatie degli Occlii.

† See Pustules of the Cornea.

over all the external parts of the eye-ball and lids;* but the degree of thickness of the slough and violence of the inflammatory symptoms vary, according to the quantity of lime, and the length of time it has been applied.

The circumstances attending this accident are strikingly illustrated in the case from which the drawing was taken. † Nearly the whole external lamella of the cornea was destroyed from the application of lime; and, from the small share of sensibility which the cornea possesses in its healthy state, the process of separation of the dead parts went on very slowly, lasting several months. After the violent inflammatory symptoms were subdued, the chalky matter began to separate at the union of the cornea with the sclerotic coat, and numerous small red vessels were seen at the place where the separation was going on. The process of

* See Plate V. fig. 3.

† Plate V. fig. 3.

separation proceeded from the circumference to the centre of the cornea; small flakes of the white matter could be daily observed to be coming away; and, after the lapse of several months, the whole disappeared, and the cornea regained nearly its natural transparency.

In some cases Ulcers form on the surface of the cornea, where no previous pustule or abscess has been observed. Sometimes they appear like a mere abrasion of the external lamina, or corneal conjunctiva, and such are usually attended with a good deal of inflammation.

There are other two kinds of Ulcers, of which I have seen a few examples. In one, a considerable number of small white points appeared on the cornea, which, in the centre, had a distinct depression, as if made by the point of a pin. In the other, there was an ulcerated surface of considerable extent; the limits, however, were distinctly circumscribed, the adjacent cornea remaining transparent, whilst the whole surface of the ulcer

was covered with a matter resembling wet chalk.*

The healing process of ulcers shews that the cornea, like most other textures of the body, is capable of Cicatrization. In most cases, this process seems to advance little farther after the principal part of the cavity of the ulcer is filled up, and a plain surface formed; so that, even after all the symptoms of disease have abated, a small dimple or inequality of surface of the cornea remains. If the ulcer has been small or superficial, the depression is almost imperceptible; but when it has been of considerable size, the inequality of surface is distinct, and if it be situated opposite to the pupil, it is very apt to render vision obscure.

The portion of cicatrized cornea, it ought to be remarked, is not only unequal, but is by no means in all cases transparent, for it often happens, that an ulcer leaves a *Speck* of the most opaque and incurable kind. †

* Plate V. fig. 2.

† See Speck of the Cornea, Chap. XI.

CHAP. VIII.

OF WOUNDS OF THE CORNEA.

Wounds of the cornea unite readily, and often without leaving any perceptible cicatrix. When the wound heals by adhesion, a very slight opacity only remains, and commonly there is nothing to be observed but a little elevation or inequality of the edges; which, in many cases, arises chiefly from the lips of the wound not having been adjusted with sufficient accuracy immediately after the wound was made. When all inflammation has abated, and a few months elapsed, the cicatrix appears like a hair sticking on the cornea; and even this can only be dis-

tinguished in certain lights by an attentive eye. In a man whose lens had been extracted, I could not, even with bestowing the greatest care, distinguish the least remains of a cicatrix of the cornea.

If a wound of the cornea, in place of healing by adhesion, goes through the more tedious process of suppuration, a considerable time elapses before the parts resume their natural form ; and there always remains an obscurity, extending from the divided edges over more or less of the adjacent cornea. When suppuration commences, the edges of the wound swell, and are separated from one another, to a considerable distance, by a yellow, tough matter, resembling albumen, which sometimes hangs down from the wound in the form of flakes. As the healing process goes on, the quantity of this matter diminishes, and the edges gradually approach each other, until a firm and complete cicatrix is formed. It is generally several weeks before this process is completed, supposing every thing to go on

in an uninterrupted course. In one case I made an incision of the common form, to discharge puriform matter, and the wound neither adhered, nor did any appearance of suppuration ever take place. But it often happens, that, when wounds are accidentally inflicted, or even in the incision of the cornea, made for extracting the crystalline lens, a portion of iris falls forwards, and either adheres to the edges of the wound, or passes completely through it. This accident is always attended with disagreeable effects; for, besides the permanent defect in the form of the pupil, and the distressing symptoms of pain and inflammation, which the strangulation of a portion of iris never fails to produce, the lips of the wound are seldom allowed to close altogether, so that the aqueous humour drills out, until a very tedious process of cicatrization is completed.

In most cases of wounds of the cornea, the subsequent opacity does not extend far beyond the edges of the wound, except in those where the inflammation has been long

protracted. It then seems to be confined to the cut surfaces; and when, in making the incision for the extraction of a cataract, the knife runs between the layers of the cornea for a considerable extent, and does not make a division perpendicular to the plane of its spherical surface, the subsequent opacity is of very considerable breadth, thus pointing out the precise form of the incision.

If a portion of the cornea be completely separated, it is never again regenerated, at least by a transparent substance; and when a portion is removed, a practice which is sometimes attended with the most happy effects, in large and very opaque specks, in some cases a similar opaque matter is regenerated.

CHAP. IX.

OF EXTRANEOUS SUBSTANCES ADHERING TO THE CORNEA.

When an extraneous substance adheres to the cornea, all attempts in rubbing the eye-lids, or forcibly winking and shutting them, rather tend to imbed it more firmly, than to remove it.

From the external lamina of the cornea being soft and yielding, the extraneous body, if small, soon forms a seat, and the constant flow of tears and disposition to shut the eye-lids produced by its irritation, bring on inflammation, which does not abate until the substance is either removed by art, or comes away by a tedious and painful process of suppuration.

When the extraneous body is removed by art, it leaves a depression in the cornea, which is often discoloured; the colouring matter, however, is soon absorbed, and the depression is generally filled up, and all surrounding opacity removed in a short time.

A few hours after an extraneous substance adheres to the cornea, the adjacent portion of cornea becomes opaque, and the opacity extends according to the violence of the inflammatory symptoms, which the irritation of the new substance creates. I have observed this opacity form very rapidly, and to a great extent, in the eyes of animals, from a similar cause; but in animals, opacities of the cornea are more rapidly formed, and are more speedily removed than those in man.

Sometimes an extraneous body remains imbedded in the cornea for a long time, and is the source of constant inflammation and pain, till suppuration takes place around it, and allows it to drop out.

It sometimes happens that, after a body is imbedded in the cornea, a layer of a new substance is formed over it, so that it does not excite inflammation, but remains through life in a kind of sac. I have observed a similar process to begin and be completed in cases where a small portion of iris had been pushed through an ulcer of the cornea. The cornea near the prolapsed iris became obscure, and the opaque matter was daily effused from the circumference towards the centre of the opening, so as finally to cover the prolapsed iris so completely, that it appeared afterwards like a common speck of the cornea.

It is, indeed, by no means uncommon for extraneous substances, as musket-balls, to remain during life in different parts of the body, by thus forming to themselves, in a similar manner, a kind of sac. In one case, I found a piece of whinstone inclosed in a sac of cellular membrane, lying close to the sclerotic coat, which had remained for ten years prior to the person's death, without

his experiencing the least uneasiness, or even suspecting its presence.

Manniske of Frankenhausen mentions a curious instance,* where a body, which stuck on the conjunctiva covering the white of the eye, gradually advanced to the central part of the cornea.

" A priest," says he, " requested my assistance concerning a speck on the eye. He had on the cornea of the right eye a dark speck, which greatly impaired his vision, and of which he gave me the following account. Two years before, he found suddenly a little pain in the eye. By examination he remarked, on the white of the eye, below the upper lid, a black spot; it did not hurt his sight, and the pain soon went away, so he took no further notice of the accident. Some time having elapsed, he was aware that this spot had changed its situation, and appeared at the union of the cornea with the sclerotic coat. The speck continued its

* Journal für die Chirurgie, &c. Von Just. C. Loder, 2d Band. 1st Stück. 1799.

progress very slowly, but uninterruptedly; it came forwards on the cornea, approached towards the pupil, and at last covered a portion of it. The patient was in this situation when I saw him. There was a prominent spot above the cornea, which felt hard, and equalled the size of a small lens, but was longer than it was broad. Many small red vessels appeared like streaks around it. The patient had no pain. The undescribable hardness of the spot, along with its situation, made me think that it was a foreign body fastened in the eye. I made an incision on the spot from without inward, and saw, with the assistance of a microscope, a black body lying in the incision. I removed it with the point of the knife, from the small hole it had formed for itself in the cornea, and found it to be a hard wing-case of a beetle."

A case in many respects similar is mentioned by Morgagni,* where an insect flew

* Letter XIII. Art. 23.

into the eye, the wing being left behind sticking to the cornea, where it created an ulcer, which immediately got well when the wing was removed.

There is a remarkable instance related by Wenzel, * where a husk of seed adhered four months to the cornea of a child. A round yellowish spot was perceived on the cornea, elevated above its surface, and from its resemblance to a pustule, had been treated as such. From this spot proceeded a number of varicose vessels diverging like radii from a centre. On examination, it was found to be the hard skin of a millet seed, which having fallen into the child's eye, stuck on the cornea in such a manner that its sharp edge and concave side adhered to this membrane, whilst its smooth and convex surface made a slight projection outwards.

* Treatise on Cataract,—Ware's Works, Vol. I. p. 81.

CHAP. X.

OF OSSIFICATION OF THE CORNEA.

The deposition of Bone is a morbid change, which takes place only in some textures of the body, and is rarely met with in the cornea.

In an eye which was changed in form, and the cornea opaque, on maceration a piece of Bone, weighing two grains, oval-shaped, hard, and with a smooth surface, was found between the laminæ. A piece of bone was also found between the choroid coat and retina of the same eye.

When dissecting an eye, for an anatomical purpose, of which no history could be ob-

tained, I found several gritty particles and inequalities on the internal surface of the cornea.

Walter had in his museum a piece of cornea, taken from a man sixty years of age, in which a bony mass was enveloped. It was three lines in length, two lines broad, and weighed two grains. *

The account of a very curious case of a piece of Bone, which was formed in the cornea, or immediately behind it, was communicated to me by Mr Anderson, Surgeon at Inverary. " Upon carefully examining the right eye of a woman thirty-one years of age, I observed a substance of a whitish appearance, in the under part of the globe of the eye, arising from the inside of the sclerotic coat, and extending upwards, below the cornea, over a great part of the iris, to very near the pupil. It had created much irritation in the eye, and induced a degree of inflammation, severe pain, almost a constant flow of tears, and inability to bear the

* Anatom. Museum, B. I. S. 139. No. 275.

light, with a considerable diminution of sight. The ball of the eye performed its natural rotatory motion, but was less in size than the left eye. This complaint had been occasioned fifteen years before, by a fall at the root of a tree, by which she struck her right eye, but did not cut any part of it."

"From this period, the above substance had begun to grow, and gradually increased in size; but the pain in the eye, and other symptoms, were sufferable until about nine months ago, when the complaint became more violent. I advised her to submit to an operation, for the purpose of extracting this substance, that appeared to injure her eye, to which she readily agreed. I made an incision into the cornea, in the manner recommended for the extraction of the cataract, then raised the flap of the cornea with a flat crooked probe, and, with the same instrument, turned out a small piece of Bone. The upper part of the bone was as thin as a piece of paper; at the under

part it was thicker, porous, and brittle, of an irregular semilunar form, and about the size of half an ordinary silver sixpence. The upper part was quite detached, but the under part slightly adhered to some part of the globe out of sight; but it was easily extracted without requiring the knife to separate its adhesions. From the unsteadiness of the patient, she would not permit me to examine from what part the ossification originated. I am consequently at a loss, whether to suppose it took its growth from any of the coats of the eye, or if any osseous matter might, in consequence of the accident, collect within the coats, and, in the course of fifteen years, form a complete bone."

The cornea varies very much in the firmness of its texture, at different periods of life, and in different individuals of the same age. In the fœtus, its cellular lamellæ adhere to one another loosely, so that it is thick and spongy, whilst in old people it is sometimes extremely hard and coriaceous. Ange-

ly remarks, that he has sometimes met with it in old people as hard as a piece of wet cartilage. *

* Commentatio Medica de Oculo, organisque lacrymalibus. Auctore, J. L. Angely.—Erlangæ, 1803.

CHAP. XI.

OF THE SPECK OF THE CORNEA. *

1. *Of the Varieties of Speck of the Cornea.*

ALTHOUGH the cornea is naturally quite transparent, yet it often happens, that the means employed to preserve it in that state are not sufficient to prevent its being rendered obscure by disease.

The obscurities or Specks to which the cornea is liable are observed to be of very different shades, varying from the slightest

* Macula Corneæ,—Die Verdunkelung der Hornhaut, or Die Flecke of the Germans.

perceptible cloudiness or mist, to a dense white, or pearl-coloured opacity. The great varieties in the degree of obscurity, as well as those in the shape, the mode of formation, the relative position, and the extent of corneal Specks, have induced some authors to consider each as a distinct species, and to distinguish them by particular names. As the meaning, however, of these names is ambiguous, there being scarcely two authors who use the same word to denote the same variety of the disease, and as it will appear that there is such a close resemblance between some, and such a similarity of character in all the forms in which Specks appear, these arrangements are not only useless, but inconsistent. Instead, therefore, of introducing a variety of names, or attempting to arrange, in a systematic manner, the varieties of this morbid alteration of structure, I shall consider the disease in whatever form it may appear, or in whatever degree, under the general

name of obscurity of the cornea, or Corneal Speck.

The *first*, and most simple variety or form of corneal Speck is, when a particular part of the cornea loses its natural transparency, and becomes clouded, objects appearing to the patient as if seen through a mist or smoke. Such obscurities are either undefined, or distinctly circumscribed, and have either an equal degree of opacity throughout, or one part is more opaque than the rest. They are most commonly of a circular or rounded form, but, in some cases, their shape is very irregular. Their size varies from the smallest spot to such an extent as to cover the whole cornea, * and they generally appear to occupy the exterior laminæ of the cornea.

In the *second* form of Speck the opacity is of a darker shade, giving the cornea a bluish, or, in some parts, a white milky appearance. It is seldom equally opaque

* Nuage—Film. See Plate VII. fig. 1.

through its whole extent, being generally more so at the centre, and becoming gradually of a lighter shade towards the margin. In some instances, the shade is very unequal in different parts of the speck. *

In the *third* form of Speck, the cornea becomes of the opaque glistening white colour of common pearl; and the opacity generally extends through the whole of the laminæ of the cornea, so that if even several of the layers which are external be removed, those which remain continue to form a complete obstruction to the entrance of light. Specks of this description sometimes produce a slight thickening of the cornea; and they are accompanied with adhesions between the cornea and iris. They are almost always distinctly circumscribed, though the edge is usually more transparent than the middle, and, if of any considerable size, they are nourished by one or more red vessels. †

* See Plate VII. fig. 2, and Plate I. fig. 1.

† Leucoma, See Plate V. fig. 3, and Plate VI. fig. 2.

In the first form of speck, the iris can be seen through the diseased portion of cornea ; but, in the second and third forms of the disease, the degree of opacity is such, that nothing can accurately be distinguished behind it.

If an active inflammation accompanies the speck, the red vessels are seen in a cluster on that part of the sclerotic coat nearest to it ; and some branches may often be traced passing over the edge of the cornea, and terminating in the substance of the speck. As the accompanying inflammation abates, the number of red vessels on the cornea commonly diminishes ; but sometimes one or more trunks remain, and are distributed on the speck.

In some cases there are large specks, with numerous blood-vessels supplying them during the continuance of active inflammation, and although the opacity remains extensive after the inflammation abates, yet no red vessels continue to nourish it. The number of blood-vessels is in no case in

proportion to the extent or degree of the opacity during any stage of the accompanying inflammation ; for a net-work of blood-vessels is frequently observed on a cornea which has very little obscurity, and at other times there is a large opaque spot with only one, or even without a single red vessel supplying it.

Specks appear on every part of the cornea, but, as far as I have been able to observe, they occur most frequently towards its centre.

Specks are most frequently formed in the external laminæ of the cornea, but it is difficult to determine accurately their situation. In some instances, I have been able to distinguish the internal laminæ alone opaque.

Specks vary in number : Commonly there is only one ; but it frequently happens that there are two, three, or more distinct spots on one cornea, each differing in size, shape, and degree of opacity.

Specks impede vision in proportion to their degree of obscurity, and according to

their situation. Even a speck of the lightest shade, which is harldy perceptible to a common observer, if situated directly opposite to the pupil, materially injures the sight; whereas those of the most opaque kind, if placed beyond its circumference, diminish the sphere, but not the accuracy of vision. In those cases where the speck is of a moderate size, and placed towards the centre of the cornea, the patient sees better in a dull than in a clear light; for in a clear light the pupil contracts so much, that it becomes covered by the speck, and the rays of light are prevented from entering it; but in a dull light that opening dilates and becomes larger than the speck, so that rays enter by its edge. Specks impede vision more when they are situated on the under than on the upper half of the cornea.

Those who have a Speck on the cornea sometimes have a Squint. In one case this was so remarkable, that I found it impossible for the eye-ball to be turned, so as to

render more than one half of the cornea visible.*

In some instances where a Speck is situated towards one side of the cornea, the pupil seems to have a tendency to dilate or extend towards that portion which remains transparent. I first observed this in an adult who had completely lost the sight of one eye, and had a large speck which formed on the temporal and central part of the cornea of the other eye soon after birth. The pupil was considerably dilated towards the nasal side, which remained transparent; so that, by this effort of nature, in drawing the pupilar opening from the opaque to the transparent part of the cornea, the patient was enabled to guide himself through the streets, and in twilight he could see large objects around him with considerable accuracy. I observed the same thing in the eye of a young woman, precisely under similar circumstances.

* See Squinting, Chap. XLVIII.

A simple speck is seldom accompanied by any sensible alteration in the external form of the cornea. In some cases where the preceding inflammation has been very violent, or where the disease has been of long duration, the cornea becomes thickened, so that its internal surface comes in contact with the iris, and adheres to it, suffering, at the same time, a slight increase in its convexity; and in many cases a cornea, which for some time was only opaque, becomes at last staphylomatous;* but in all such cases ulceration of the cornea will generally be found to have previously taken place.

Besides those varieties of Specks which have been described, there are others that occur much less frequently, the mode of formation and appearances of which are somewhat different.

I have remarked a few instances where the cornea acquired a very peculiar *mottled*

* Vide Staphyloma, Chap. XII. and Plate VIII. fig. 3.

appearance. In one case this was the consequence of an inflammation of the eye, which came on during a mercurial course, and, in another, it was the effect of an inflammation occasioned by lightning. In both these cases, some parts of the cornea retained their transparency, while the rest was covered by a number of very small, white, rounded spots, varying in obscurity.*

In some cases the opacity, instead of being formed towards the central part of the cornea, or at some distance from its circumference, begins at the place of junction of the cornea and sclerotic coat, and gradually extends towards the centre of the cornea, forming an opaque ring around its circumference. Most authors have described this as an appearance only to be remarked in the eyes of those advanced in life, and have given it the name of *Arcus Senilis.* Though it is usually met with in old people, yet I have observed it at all periods of life, and it

* See Ware's Works, Vol. I. Case XII.

may be seen in several of the drawings which were taken from young subjects.* It generally appears like a bluish ring at the edge of the cornea, and extends round the whole of its circumference. It is almost universally to be found more or less distinct in the eyes of old people, and it increases in breadth as the person advances in life, but is never attended with any impediment or inconvenience to vision.

In a few instances I have observed a cloudiness gradually extending from several points, or from the whole circumference of the cornea towards its centre, which, in most cases, went off along with the inflammatory symptoms by which it was accompanied; but in others it was more permanent.

In a patient under the care of the late Mr Gibson of Manchester, the cornea of both eyes became milky at different times every day, and generally after half an hour, or

* See Plate I. fig. 1, Plate III. fig. 3, Plate VII. fig. 3.

sometimes longer, they recovered their transparency.

I have known one instance where this disease appeared to be *hereditary*. Four branches of a family had the cornea of each eye affected with Speck. The cornea of all these persons had a general cloudiness, with opaque white spots interspersed on different parts.

There is another variety of Speck which appears at birth, and which may, therefore, be with propriety denominated *Congenital*. In this disease the whole anterior chamber is more or less clouded, accompanied by no apparent inflammation. As the child affected with this disease advances in life, the obscurity is gradually diminished, so that generally in one or two years the transparency of the cornea is completely restored. The period of restoration is, however, very different in different cases. In one instance, an eye had nearly quite recovered about the eighteenth month, whilst the other still remained very obscure.

Professor Withausen of Copenhagen saw

a family, consisting of three boys and three girls, the three girls being born with this congenital obscurity of the cornea. They all recovered perfect vision when about four years of age. Cases of this congenital imperfection have also been recorded by Mr Farr of Deptford. *

2.—*Of the Formation of Specks of the Cornea.*

Specks are most commonly either preceded or accompanied by Inflammation or Ulceration of the Cornea. In children they occur very frequently during the progress of the more severe cases of the puriform ophthalmia,—in small-pox and measles,—in that peculiar inflammation of the eyes accompanied with eruptions of the head,—and in all those inflammations in which the cornea participates. Lues venerea and Scrofula, each of which produce specific inflam-

* Medical Communications, Vol. II.

mations of the different structures of the eye-ball, also occasion various degrees of obscurity of the cornea. Likewise wounds of the cornea accidentally inflicted, or for the extraction of the cataract, if they do not unite without suppuration, generally leave an opaque mark; and Ulcers, if they have been deep, or of long duration, are followed by white pearl-coloured Specks.

When the inflammation accompanying a Speck abates, the speck most commonly diminishes, and the opacity which remains becomes more distinctly defined, and less opaque; or, if small, it entirely disappears.

In some instances the cornea acquires a very remarkable degree of obscurity, when the inflammatory symptoms are apparently mild, and where there is very little perceptible redness. I have observed several instances of this kind, and in all of them the obscurity came on by very slow degress, and was attended by no pain. *

* Traité de Maladies des Yeux, par A. P. Demours. Paris, 1818.

The length of time necessary for the formation of Specks varies much in different instances. In some cases they are formed very slowly, and do not acquire any great degree of opacity, even when the inflammatory symptoms are extremely violent. Most frequently they require several weeks or even months before they become either large or very opaque; so that when they are of considerable size, it may generally be concluded they have been formed after repeated inflammatory attacks, each attack having added both to their size and degree of opacity. Sometimes they are formed very rapidly, as in cases where the cornea is wounded, or where a foreign body has adhered to it.

Specks are formed at every period of life, but they occur most frequently in young people; probably because in them the cornea is much softer and more spongy, and, also, as they are more subject than adults to the various inflammatory complaints of the eye.

The specks which are formed rapidly are in general most speedily removed, whilst those whose progress is slower disappear in a more gradual manner.

It may in general be remarked, that when a part of the cornea has become opaque, the opacity begins to disappear at the circumference of the speck, or at that portion nearest the circumference of the cornea. This probably depends on the vessels being more numerous at the circumference than at the central part of the cornea.

In some cases it may also be observed, that the external laminæ first regain their transparency, the opacity disappearing from the external towards the internal parts.

Specks are removed much more quickly in children than in old people, and in them also a much greater degree of obscurity can be made entirely to disappear.

Specks described under the first and second forms generally disappear either by the use of remedies, or in some cases, after the inflammatory symptoms are sub-

dued. Those of the opaque pearly-colour seldom disappear, even by the use of the most active means, and even if portions of them are cut away, the opacity in most cases is found to penetrate to the internal lamellæ, and is generally regenerated by an equally opaque matter.

When applications are employed with the view of removing specks, the obscurity generally diminishes much more rapidly for a short time at first than at any future period.

Dr Vetch, in his excellent treatise on the Egyptian Ophthalmia,* gives an account of a singular instance, which shews the rapidity with which some forms of speck disappear under particular circumstances. It occurred in a man during his convalescence from ophthalmia. "Some pectoral symptoms, to which he had been long subject, suddenly assumed the appearance of pulmonary consumption, which proceeded in

* See Account of an Ophthalmia, &c. by John Vetch, M. D. 1807.

a rapid manner towards its last stage. Five days previous to his death, he was seized with a violent aggravation of the hectic fever and the other symptoms, and his death was hourly expected. At this time, to the surprise of all his attendants, the opacities, by which the vision in both eyes had been long obstructed, disappeared with amazing rapidity; and, a short time before his death, his vision became nearly as distinct as ever."

A case, though of a different kind, deserves to be mentioned in this place, as it strikingly illustrates the same remarkable power in the absorbent system. A patient had a very perceptible obscurity of the crystalline lenses of both eyes, which had considerably impaired his sight. This complaint had continued for several months, when he was seized with a pain of the chest, attended with fever and spitting of blood. These symptoms continued for several weeks, and, during that period, the obscurity of the crystalline lenses altogether disap-

peared, and his vision was restored. I saw him many months afterwards, when his eyes continued well.

3.—*Appearances of Speck on Dissection.*

When the cornea is examined after death, no change of structure can be observed in those cases where there has been a mere cloudiness, or general opacity during life; for even before death, more especially if it be slow and lingering, the fluid which, in the natural state, is deposited between the lamellæ of the cornea, exudes, forming an obscure layer over its anterior surface, and the aqueous humour oozes out, giving the cornea an unequal puckered appearance. * Indeed, it is from this change in the eye that approaching death is often foreseen; for, whenever the cornea begins to collapse, and becomes turbid, the eye loses all its

* Anatomie Descriptive, par Xav. Bichât.

lustre and intelligence, and gives that awful expression to the countenance, which has been called *facies hypocratica.*

When the cornea has been much more opaque, no other change is to be perceived after death, than a diminution of the transparency, either of the external laminæ, or of the whole substance of the cornea. I have had many opportunities, in the living body, of taking off layers of very opaque specks, and have never been able to observe any other change of structure, except that, in some of those opacities which have been of long duration, the cornea had acquired a degree of hardness much greater than that of sound cornea, and even, in some instances, it cut like cartilage.

In most cases, a Speck bleeds when a piece of it is removed in the living body; and I have observed this happen even when no red vessels could be detected by the naked eye passing into it.

An incision made in the healthy cornea gives little or no uneasiness, but, when a

portion of speck is removed, it often excites acute pain.

4.—*Causes of Specks of the Cornea.*

As the deposition or effusion of the albuminous part of the blood is a common effect of inflammation in many organs of the body, and as this change produces a diminution in the transparency of serous membranes, it is probable, from analogy in the natural structure, that a similar change takes place in the cornea, during the formation of speck. This effect of inflammation is very remarkable in the pleura, after an attack of pleurisy; in the peritoneum after peritonitis; and in the membranes of the brain after phrenitis: for, on dissection, it is invariably found, that there is not only an effusion of albumen on the surface of these membranes, but the membrane has likewise become thicker, changed its colour, and lost its transparency.

It is, perhaps, difficult to determine whether the new matter, added to the diseased cornea, be effused among its layers, but it appears to me the most probable opinion. It has already been remarked,* that the cornea is composed of a number of concentric cellular laminæ, and that a fluid is deposited in its cells by exhalation. It is, therefore, in the cellular structure in which this fluid is contained that albumen may probably be deposited, the cells being like as many serous surfaces, and subject to similar morbid changes.

An opacity may also be produced by the cornea losing its vitality. This change may arise either from the inflammation being so violent as to terminate in the death of the part, or from the action of caustic substances, such as lime or lunar caustic. †

When lime or caustic gets into the eye, a white film is formed on that part of the cornea which it touches. This either sepa-

* General Remarks on the Cornea, Chap. I.

† Ulcer of the Cornea, Chap. VII.

rates in the form of a scale or slough, or is absorbed, leaving the subjacent cornea quite transparent.

In a patient in whose eye a drop of melted tallow fell, a large white Speck appeared on the centre of the cornea, which evidently arose from opacity of its external lamina. By applying leeches to the temple, and giving a purge, on the following day no vestige of the speck could be seen, and all inflammation had subsided.

Mr Nickolson saw a patient with mercurial erythema, in whom both cornea lost their transparency during one night, appearing dry, and exactly resembling an eye which has been exposed to the air for some time after death. In a few days they regained their natural appearance.* I have observed the cornea acquire a similar appearance when, from the want of the secretion of tears, the corneal conjunctiva had become dry and opaque. This was very

* Edinburgh Medical and Surgical Journal.

remarkable in a young woman who was born without any lacrymal organs.

It is also probable that the cornea may become obscure by an alteration in the quantity of the contents of the eye-ball, producing a change in the arrangement of its component particles. In the dead body this change is very remarkable, for, if pressure be applied to the eye-ball, or if the ophthalmic veins be injected with quicksilver, or pure water, so that the quantity of the contents of the globe be increased, the cornea is found to lose its natural transparency, and to acquire a milky colour. * As it was probable, from this curious phenomenon in the dead eye, that, in the living body, some opacities of the cornea might arise from an increase in the quantity of the contents of the eye-ball, it appeared to me, that, in cases of this kind, the opacity might be removed, by making

* The Muscular Motions of the Human Body, by John Barclay, M. D. 1808.

a puncture through the cornea, and discharging the aqueous humour.

That a certain degree of opacity of the cornea in the human eye is sometimes produced by a mere derangement of its component particles, is proved from the immediate effects which followed the discharge of the aqueous humour, in cases where the opacity had a general clouded appearance over the whole cornea, besides some defined spots at particular places. In some cases of this kind, the instant I discharged the aqueous humour, by a small opening in the cornea, all the general obscurity disappeared, and nothing remained but the very opaque spots, which became more distinctly circumscribed. *

In the lower animals, I have had several opportunities of observing the cornea affected with a general obscurity and cloudiness,

* See "Observations on the Effects of Evacuating the Aqueous Humour in Inflammation of the Eyes," in the Edinburgh Medical and Surgical Journal for January 1807, and in the Transactions of the Medical and Surgical Society, Vol. IV.

which was not like common speck, but more resembled that obscurity so easily produced artificially in the dead eye, by injecting the veins, or by the application of pressure. A disease of the cornea, very similar, is common among sheep that have made long journies, or have been much fatigued; and, although the opacity of the cornea is in them accompanied with little apparent inflammation, or fulness of vessels, its transparency is quickly restored by the common practice of the shepherds, which is opening a vein at the inferior part of the orbit, and allowing the blood to flow over the eye. * The same kind of obscurity of the cornea is by no means unfrequent among dogs and horses, who, after having been long fed in stables where their food is placed high, are put out to graze, and their heads kept constantly on the ground.

* See Dr Duncan's Essay on the Diseases of Sheep, in the Transactions of the Highland Society of Scotland.

CHAP. XII.

OF STAPHYLOMA OF THE CORNEA.

When the cornea, besides losing its transparency, is altered in thickness, and forms a prominent tumour externally, the disease has generally been called Staphyloma. *

This term, however, has had very extensive applications, having been employed by some authors to denote not only various morbid changes of the cornea, but also a variety of tumours involving other parts of the organ of vision. I shall follow Richter, and limit its signification to those

* Das Staphylom,—Der Forfall der Hornhaut of Richter, —Ceratocele,—Corneal Hernia.

changes which produce an alteration in the structure and form of the Cornea and Sclerotic coat. *

When the structure of the whole Cornea is changed, the disease has been called *Staphyloma totale*, and when confined to a particular part, *Staphyloma partiale.*

In Staphyloma, where the whole cornea participates in the disease, it generally assumes a form more or less rounded or conical,† loses its natural transparency, and vision is completely destroyed.

The opacity is often most remarkable towards the apex of the tumour, and is generally of a pearly white colour, diffused through the whole corneal substance. ‡

In some instances, I have remarked the opacity confined to one-half of the cornea, which has generally been the inferior one. §

* See Diseases of the Sclerotic Coat, Vol. II.

† Staphyloma conicum et rotundum.

‡ See Plate VIII. fig. 2.

§ Plate VIII. fig. 3.

As far as I have been able to observe, Staphyloma never occurs unless the cornea has been previously ulcerated, and unless the ulcer has penetrated into the cavity of the aqueous humour, or destroyed the cornea as deep as its internal tunic.

Hence the internal surface of the cornea adheres to the iris in almost every case of Staphyloma, so that, in this disease, the anterior chamber is often found almost entirely obliterated. This takes place in consequence of the discharge of the aqueous humour through the ulcer and the cornea allowing the iris to come in contact with the cornea, and thus to form adhesions with it. The adhesion between the cornea and iris happens most frequently, and to a greater extent, in children, for in them the cornea is much thicker than in adults, and is very nearly in contact with the iris even in the sound eye.

In Staphyloma, the pupil is hid according to the situation and degree of opacity of the cornea; but in most cases it is alto-

gether obliterated, and, even where a transparent portion of cornea is opposite to it, vision is much impaired; for, as the eye has lost its form, like an optical instrument, the change in its refractive power renders objects seen through it very indistinct.

If the tumour be recent, and has not acquired a very large size, the diseased portion of cornea, when cut into, will be found softer and more spongy than the transparent part; and, generally, if the incision penetrates into the anterior chamber, only a very small quantity of aqueous humour flows out. This is more particularly the case in children. But, when the tumour is large, and formed in an adult, the cornea often becomes extremely hard, and much thinner than natural, and the quantity of aqueous humour, instead of being diminished, is greater than in the sound eye. Scarpa mentions having found the cornea, in some cases of staphyloma, as hard as parchment, and even converted into bone; Rich-

ter * relates a case where it resembled a cartilaginous excrescence; and Beer † describes and gives a delineation of a Staphyloma which was so thick and tough, that, on cutting it away, he could scarcely penetrate it with the knife.

Usually the staphylomatous cornea has vessels containing red blood ramified through it, and there is generally one or more trunks distributed on the sound part of the cornea, which are continuations of vessels on the white of the eye, some of which appear superficial, belonging to the conjunctiva, whilst others are deep seated. ‡

When vision is altogether destroyed, and the disease has extended far, the humours collect in great quantities, and, in some cases, form a tumour of an enormous size. § In such cases, the eye does not retain its conical form; for, when the cornea has be-

* Chirurgische Bibliothek, Vol. VIII. S. 76.

† Practische Beobachtungen über den grauen Staar und die krankheiten der Hornhaut. Wien, 1791.

‡ See Plate VIII. fig. 2, and Plate IX. fig. 3.

§ Haller's Dissertationes Chirurg. Tom. I. p. 25.

come so much distended, and when the humours have insinuated themselves between its laminæ, one part yields more readily than another; the tumour becomes irregular in its form, hangs over the under eyelid, and, in many cases, has the appearance of a large swelling composed of several smaller ones. A change also takes place in the colour of the tumour. Instead of the opaque white, or pearl-coloured opacity, it becomes of a dark blue colour, and sometimes one or more of the smaller swellings are semi-transparent. A fluid can be felt fluctuating within them, and they appear as if ready to burst.

The blood-vessels increase both in number and size along with the bulk of the tumour, and they will sometimes be seen ramifying and forming net-works in a most beautiful manner over its whole surface. * In cases of this description, the patient generally complains of more or less pain, not

* See Plate IX. fig. 3.

only in the eye, but also in the brow of the affected side, and this pain often extends to the other eye.

If the bulk of the swelling prevents the eye-lids from closing, the exposure to bodies floating in the air, and the contact of the ciliæ, always excite more or less inflammation on the eye-ball and lids. At the same time, also, it often happens, that the tears are of an acrid and irritating quality, inflaming and excoriating the outer surface of the palpebræ and cheek. In this situation the patient is often relieved by a part of the tumour giving way, and allowing the contents of the eye-ball to escape. Even when this has taken place, and the subsequent inflammation has abated, the disease sometimes returns as before, and a large staphylomatous tumour is again formed. More frequently, however, the cornea remains collapsed into a whitish mass, in which no vestige remains of natural structure.

When the eye is in this state, if the dis-

organized cornea be accurately examined, a dark point will be discovered not larger than a small pin-head, on some part of the opaque portion. This will be found to be a fistulous orifice leading into the anterior chamber, but actually covered, in most cases, by an extremely delicate, pellucid membrane, which, if punctured with a needle, gives outlet to a larger or smaller quantity of aqueous humour. This opening seems to me to be established for the purpose of carrying off the superabundant aqueous humour, the secretion of which is not arrested by the disease; and I have had frequent opportunities of observing a staphylomatous eye become extremely painful and inflamed, which symptoms were instantly relieved by puncturing the membrane by which the fistulous opening was covered, and thus discharging the aqueous humour.

The sudden relief which is produced by the discharge of the contents of an eye affected with Staphyloma, may be accounted

for on the same principles as the utility of the practice of evacuating the aqueous humour in violent inflammation of the eyes, or in the rupture of a common abscess. This effect, as well as the mode by which a fistulous opening was established, are so strikingly illustrated, and so accurately described in the following case of a medical gentleman who had been seized with violent ophthalmia in both eyes, which was followed by Staphyloma, that I shall give an account of the case in his own words.

" When my eyes were examined, I was told that there was a considerable elevation of the cornea of both, but particularly of the left; indeed, this was quite evident to my own sense of touch. In July 1800 I returned to England; and, on my voyage from London to Edinburgh, I was much surprised, one morning when I awoke, to find that the Aqueous Humour was completely discharged from the left eye; the eye being quite soft. The opening by which it had escaped soon closed, and the humour again

collected; but I conceived that the cornea was not quite so prominent as formerly. From this circumstance I concluded, that if the humour was again evacuated, the eye might assume its natural form, or at least approach nearer to it. In March 1801, I attempted to make a small perforation in the cornea with a large needle, and succeeded easily in evacuating the aqueous humour. This, I think, was repeated at least three times, and the eye gradually acquired its present shape. I wished to perform the same upon the right eye, but was baffled, on account of its greater sensibility. If I can place any dependence on my own feelings, I think the left eye was never perfectly free of inflammation until the above mentioned evacuations were effected; though they were made without having the most distant idea that such would be the result of them.

" About three years ago, when rubbing the right eye with my finger, it suddenly became soft, part of the aqueous humour hav-

ing been discharged. Since that time, two or three drops have flowed out every week. But if, as it sometimes happens, the discharge does not take place in the time mentioned, I am in general seized with a pain immediately above the right eye-brow, accompanied with a sensation of tension, and uneasiness of the eye itself: These symptoms, however, vanish when the accidental evacuation takes place.

"When the humour was first discharged, a small degree of pressure upon the eye, when soft, gave considerable uneasiness; and the pain seemed to be situated in the bottom of the eye. The pain, however, is not now excited by the same degree of pressure."

The cornea being in young persons more spongy in its texture, and much thicker than in adults, is probably the cause why they are more subject to this disease. * Scarpa mentions, that he never saw a Staphyloma of such

* Angely, Commentatio Medica de Oculo, &c.

a size as to project beyond the eye-lids, which did not begin during childhood. I have, however, seen several instances, particularly where the disease arose in consequence of an wound, in which the tumour extended beyond the eye-lids, and did not commence till the patients were advanced in life: These cases, however, are no doubt rare.

Staphylomas which arise after wounds in the eye with sharp pointed instruments, present nearly the same appearances as those which have been already described. In such cases, the swelling is generally more irregular in its shape, the coats are thinner, the disease advances more rapidly, and is attended with much more pain and inflammation.

Though Staphyloma generally attacks only one eye, in some cases it affects both, and it is not unfrequent to see a person with two staphylomas.

I have seen also one case of this disease, where the sympathy between the two

eyes was very remarkably illustrated. A person received a blow with a pike on one eye, which produced staphyloma, and more than a year afterwards, the other eye became inflamed, and the cornea of it also became gradually staphylomatous. *

In those cases of staphyloma which are accompanied with pain, the other eye becomes often weak, uneasy, and irritable, all which symptoms disappear when the staphyloma is relieved.

Staphylomas are variable in their progress; sometimes they grow suddenly to a certain size, and afterwards remain stationary; sometimes they grow progressively larger till they burst; and often they increase in bulk as if by starts. From small-pox particularly, and also in consequence of the puriform ophthalmia, staphylomas grow rapidly, and the coats of the tumour appear extremely thin; but, after some time, they seem to acquire additional thickness and

* See Sympathy of the Eyes, Vol. II. ii.

strength, whilst the tumour remains of the same size. Richter * remarks, that the swelling and thickening of the cornea sometimes depart with the accompanying inflammation.

Staphyloma occasionally occurs where only a small portion of cornea is affected, in which case the disease is called *Staphyloma partiale.* Sometimes there is only one swelling of this kind, and sometimes several of them arise in the same cornea, forming an irregular shaped mass, which has been compared to a cluster of grapes ; hence the name *Staphyloma.* Such swellings vary from the size of a pin head to that of a small pea. In some cases they are transparent, communicate with the anterior chamber, and contain a quantity of aqueous humour, or even a portion of iris. More commonly they are horny or warty excrescences, and if cut off, they generally grow again. † Tumours of this kind are often observed where there

* Richter's Angfangsgrunde, B. iii.

† Richter's Angfangsgrunde.

have been wounds or ulcers of the cornea; but they are also met with where there has been no such previous cause.

There is also a formidable disease, a few examples of which I have seen, and traced the progress, which, perhaps, may be with more propriety considered as a variety of staphyloma than any other disease. It occurred in adults, whose eyes had been exposed to much fatigue, and suffered from deep-seated, and long continued inflammation; but I have seen one or two cases of this disease, where, from its commencement, and during its whole progress, there was neither pain nor any inflammatory symptom. Whilst the sphericity of the cornea increased, the aqueous humour became turbid, and substances were seen floating in it, resembling flakes of the black pigment. The crystalline lens also became opaque, and appeared to separate into pieces, and moulder down. The sclerotic coat became preternaturally distended, and instead of retaining its pearly white colour, it assumed a dark

blue, or almost black shade. At last, a large prominent tumour of the cornea was formed, more spherical than the common staphyloma, which terminated by bursting, and in a total loss of the organ.

CHAP. XIII.

OF ALTERATIONS IN THE FORM OF THE CORNEA.

The form of the cornea varies in different persons, and in the same individual at different periods of life.

It is in many so convex, that objects are seen very indistinctly, unless when held close to the eye, or viewed with the assistance of concave glasses. This preternatural convexity of the cornea is sometimes the failure of original organization, at other times it is produced from some morbid change. *

* Myopia.—Kurzsichtigkeit.

The cornea is most convex at the earlier periods of life, and, as far as I have been able to observe, it is very liable to acquire its greatest degree of convexity about the age of puberty, persons being most apt to become short-sighted at that period. The pupil is always very large in those who have a convex cornea; but there does not appear to be any deviation from the natural state in the structure of the cornea.

When people advance in life, the cornea gradually loses its convexity, in consequence of the quantity of humours within the eye-ball being diminished. * In the case of a girl eight years of age, the cornea of each eye was observed to be remarkably flat, and vision had been imperfect from her infancy. In persons much enfeebled by evacuations, by numerous bleedings, or by disease, the quantity of the aqueous humour diminishes, the convexity of the cornea is lessened, and the sight is enfeebled, so that

* Presbiopia.--Weitsightigkeit.

they are not able to see objects but at a distance. *

The cornea is also observed to collapse at the approach of death, particularly if it be slow and lingering. †

From the ingenious experiments of Sir Everard Home, and the late Mr Ramsden, recorded in the Philosophical Transactions, it appears probable that the sphericity of the cornea is somewhat altered according to the distance at which objects are viewed.

I have known several instances of persons who, in order to see minute objects, were in the habit of squeezing the eye-ball with the point of a finger, the effect of which probably was to elongate the visual axis by increasing the convexity of the cornea.

The power which the eye has of changing its form, is also very remarkable in those who have had a cataract removed; for, when the eye has recovered from the inflammation and irritability occasioned by the

* Vide Anatomie Medicale, par Portal.

† Vide Anatomie Descriptive, par Xav. Bichât, Tom. III.

operation, so as to allow the person to look at objects, it requires commonly the assistance of a lens of two and a half inches focus to read a common printed book; but, if lenses of lesser powers be gradually used, the eye, by accommodating itself to the change, will see very distinctly with a glass of much smaller power than what was first necessary. Thus a person generally finds his sight improve for many months after the removal of the lens; and the change appears chiefly to arise from the cornea gradually acquiring a greater degree of convexity, by the action of the muscles of the eye-ball.

Mr Ware observed the cornea acquire a very considerable degree of convexity during a short attack of inflammation. A gentleman, after recovering from a severe attack of a Rheumatic Ophthalmia, could read without a magnifying glass, which he had previously found necessary for many years.

I met with another case precisely similar, and I conceived that this change arose from

the cornea having acquired an additional degree of convexity.

Besides these slighter changes in the form of the cornea, it sometimes collapses so much, or increases to such a size, whilst at the same time it retains its transparency, that the functions of the eye are much interrupted, or even entirely destroyed. In the first case, the disease has been called *Rhytidosis ;* and in the second *Staphyloma Pellucidum.*

A boy was born with a cataract in one eye, and in the other orbit there was scarcely the vestige of an eye-ball, nothing like cornea being perceptible. A child was born with eye-balls not larger than a pea, in which no organization could be discovered. It is most probable, that the eyes had been destroyed by disease whilst in utero.

The corrugation or collapse of the cornea arises either from a diminution in the quantity of the contents of the eye-ball, or from some disease of the cornea, or sclerotic coat. Violent inflammation of the eye, wounds

and ulcers of the cornea, penetrating into the anterior chamber, are frequently followed by this disease.

After violent deep-seated ophthalmia, it is not unfrequent to observe the eye-ball alter in its form, and become smaller; the change appearing chiefly to arise from a diminution of the anterior chamber. *

Sometimes this change is only such that the cornea becomes nearly a plane surface, and falls into contact with the iris. In other cases it becomes puckered, and a furrow is formed, sometimes at one part, at other times completely across the cornea.

The adjoining part of the sclerotic coat sometimes assumes the same form, and is corrugated in a similar manner.

It seldom occurs that there is such a total change in the appearance of the cornea, that the original division between it and the sclerotic coat cannot be distinguished. I have seen a few cases where no such line

* See Plate IX. fig. 2

of demarcation could be observed. * Reil † could distinguish no remains of the cornea in a blind eye, which had grown smaller for eighteen years. " The eye-ball appeared to be formed of four parts; two deep furrows divided it, which probably arose from the action of the four straight muscles."

It also sometimes happens, that the cornea is lessened to half its natural size, or is altogether wanting, from an original malconformation. ‡

It very frequently, too, happens, that the eye-ball does not recover its natural form after the cornea or sclerotic coat has been wounded; for, although the wound heals soon after the accident, yet there is often so much inflammation excited, and such extensive injury done to other parts of the eye-ball, that the humours are neither again

* See Plate VI. fig. 3.

† Archiv. fur die Physiologie, von Joh. Christ. Reil.

‡ Vide Handbuch der Pathologischen Anatomie, von Voigtel.

collected in sufficient quantity, nor does the retina recover its power.

Ulcers are still more apt to produce a permanent change in the form of the cornea than wounds. When these penetrate the whole thickness of the cornea, and allow the aqueous humour to escape, they heal so slowly that the relative situation of parts is permanently altered; the iris comes in contact with the cornea, and sometimes projects through the ulcerated opening, so that the aqueous humour oozes out until the ulcer is healed, the eye afterwards remaining of an unnatural shape.

Vision, in such cases, is always more or less impaired, and sometimes altogether destroyed.

Of the Conical formed Cornea.

Léveillé, * the French translator of Scarpa's work on the Diseases of the Eye, has

* Vide Traité sur les Maladies des Yeux, traduit de l'Italien de Scarpa, par J. B. F. Léveillé, Tom. II. p. 179.

described a case where the cornea of both eyes were of a conical form. Frequent examples of a similar disease have fallen within my own observation.

In these cases the conical form of the cornea has been more or less distinct, in some the anterior chamber appearing unusually prominent, whilst in others the conical figure was much more remarkable.

The apex of the cone has generally been in the centre of the cornea or near it.

An eye affected with this disease, when viewed laterally, resembles a piece of solid and very transparent crystal, and when looked at directly opposite, it has a transparent and sparkling appearance, preventing the pupil and iris from being distinctly seen.

In the cases of this disease which I have examined, there has always been a small portion of the cornea where the surface was irregular, having very much that appearance which is usually observed when a thin pellucid membrane fills up a part of the cor-

nea, which has previously been destroyed by ulceration. The irregular portion of cornea at the apex is generally very thin, and sometimes becomes clouded and opaque. In one case, a gentleman who had this disease received a blow with a whip on his eye, which burst the cornea.

From these observations it is probable that where the cornea becomes conical, it is always the consequence of a change in the structure of that organ.

This disease of the cornea usually advances imperceptibly. It generally begins in one eye, though the other frequently becomes sooner or later affected. After first becoming prominent, the cornea gradually assumes the conical form, and the disease seldom advances equally far in both eyes.

Like common short-sightedness, this change in the form of the cornea takes place most frequently about the age of puberty, or at least assumes its most advanced form at this period of life. In one instance I met with it in a boy eight years of age.

The change produced in vision by this disease is merely short-sightedness in the early stages; but when the cone becomes distinct, and its apex very irregular, the changes are very remarkable. They are illustrated in the following case of a lady thirty years of age, in one of whose eyes the cornea was unusually convex, and in the other it was conical.

At one, or one and a half inch distance, she could distinguish small objects distinctly, when held towards the temporal angle of the eye, although it required considerable exertion; but the sphere of vision was very limited.

On looking through a small hole in a card, she could distinguish objects held very close to the eye, and could even read a book.

At any distance greater than two inches vision was very indistinct, and at a few feet she could neither judge of the distance nor of the form of an object.

When she looked at a luminous body at a distance from her eye, such as a candle, it

was multiplied five or six times, and all the images were more or less indistinct. She could never find any glass sufficiently concave to assist her vision. She did not remark this complaint in her eye, until she was about sixteen years of age, and she does not think that it has undergone any change since that time.

On mentioning to my ingenious friend Dr Brewster this case, which appeared to me so remarkable, he examined the eye, and favoured me with a most satisfactory and philosophical explanation of all the phenomena :

" When you first mentioned to me the case of Miss ———, I was much surprised at the number of images which she observed round luminous objects. As this multiplication of images could arise only from some irregularity in the cornea, or crystalline lens, which gave their surface the form of a polyhedron, it was completely inexplicable from the shape of the cornea itself, which your drawing represented as a re-

gular surface,* resembling very much that of a hyperboloid; for the only indistinctness occasioned by a cornea of this form, would arise from the concentration of the rays before they fell upon the retina.

"When I examined the eye itself, the difficulty of explanation was in no respect diminished. In every aspect in which the cornea could be viewed, its section appeared to be a regular curve, increasing in curvature towards the vertex; a form which could produce no derangement in the refraction of the incident rays. As the disease was evidently seated in the cornea, which projected to an unnatural distance, it did not seem probable that there was any defect in the structure of the crystalline lens. I was, therefore, led to believe, that the broken and indistinct images which appeared to encircle luminous objects, arose from some eminences on the cornea, which could not be detected by a lateral view of

* See Plate VII. fig. 1.

the eye, but which might be rendered visible by the changes which they induced upon the image of a luminous object that was made to traverse the surface of the cornea. I therefore held a candle at the distance of fifteen inches from the cornea, and keeping my eye in the direction of the reflected rays, I observed the variations in the size and form of the image of the candle. The reflected image regularly decreased when it passed over the most convex parts of the cornea; but when it came to the part nearest the nose, it alternately expanded and contracted, and suffered such derangements, as to indicate the presence of a number of spherical eminences and depressions, which sufficiently accounted for the broken and multiplied images of luminous objects." *

* Since the above letter was written, Dr Brewster has had occasion to examine a great variety of cases of conical cornea; and in all of them, without exception, he has detected inequalities in the superficial conformation of the cornea. He conceives, therefore, that the disease is incurable, but that its injurious effects upon vision may, within certain limits, be removed by glasses, and by preventing the image from being

Beer * mentions, " That there is a kind of Staphyloma worthy of remark, which I have seen in more than one case of hydrophthalmia." He adds, " The cornea, in such cases, is inconceivably distended, but it does not lose its transparency; when punctured, it is found to be very thin, and it has also happened that it has burst. The patients, notwithstanding the transparency of the cornea, saw little or none at all.

" I had last year an opportunity of observing a remarkable case of this kind in a woman, who, after an inflammation of the brain, was seized with a violent inflammation of the left eye. Soon after, she was attacked with a very violent pain in the left half of the head, and afterwards with an uncommon weakness of sight. The eye was a little red, and then swelled; the pupil was very much dilated, and contracted but slowly. During this attack, the iris gradually

formed by rays which pass through any part of the corrugated surface.

* Pratische Beobachtungen uber den Grauen Staar, &c.

changed its colour, and at last became quite red. The stinging pain soon became heavy and beating, and the patient lost the sight of this eye altogether, whilst the cornea continued to expand. I was at last forced to make an incision into the cornea, to prevent its bursting, but the aqueous humour was soon renewed. I repeated the operation; and the constant application of a cold vinous infusion of bark after it, prevented the eye from again filling. The organ afterwards remained shrunk; the iris retained its reddish colour; the pupil continued much dilated and immoveable, and she never recovered her sight." *

Richter † says he never saw this disease; Burgman ‡ saw a very remarkable case, where the cornea of both eyes of a person who was hanged were so prodigiously extended, that they reached down to the mouth like two horns.

* See Plate IX. fig. 2.

† Richter's Angfangsgrunde.

‡ Haller Disputationes Chirurg. Tom. II.

CHAP. XIV.

OF EFFUSION OF BLOOD BETWEEN THE LAMINÆ OF THE CORNEA, AND IN THE ANTERIOR CHAMBER. *

THE effusion of blood between the laminæ of the cornea, or into the anterior chamber, is generally the consequence either of violent inflammation or of wounds.

When treating of inflammation of the cornea, I took notice that it sometimes happened that blood was effused between its laminæ. When this takes place, a dark red-coloured circumscribed spot appears on

* Hypoæma—Das Blutaug of the Germans

some part of the cornea, which never alters its situation, but remains stationary until it is absorbed. When the internal parts of the eye are much inflamed, the aqueous humour often loses its natural transparency, and becomes tinged of a red colour from the admixture of blood. The red shade turns deeper as the quantity of effused blood increases, and in very violent inflammation, the blood is sometimes effused in such a quantity as to render the aqueous humour so opaque, that the iris and pupil cannot be distinguished.

An wound of the iris, whether made accidentally or during any of the operations for the cure of cataract, is very often followed by an effusion of blood into the anterior chamber; and it also happens that blood is effused, not only when an wound has been received, but even some days afterwards, probably the consequence of subsequent inflammation. *

* This disease has been called *Cataracta secundaria Crumosa*. See Vol. II.

I have seen several instances of an effusion of blood from an improper use of the couching needle, and also when the iris has been torn from the ciliary ligament, in order to form an artificial pupil. The blood, however, is, in such cases, readily absorbed, and followed by no bad consequence.

It sometimes happens, that blood is effused into the anterior chamber from a violent blow on the eye. A very remarkable case of this kind was under the care of Mr Campbell, surgeon of the Inverness-shire militia: In consequence of a blow with the fist, a drop of blood was effused in the anterior chamber, at the junction of the cornea and iris, but in a few days it was altogether absorbed.

There are also diseases of the iris, and of the internal parts of the eye, which are attended with hemorrhage, and which tinge the aqueous humour with blood. Voigtel * mentions a case where the quantity of blood was so great as to distend the eye-ball, and

* Des Pathologischen Anatomie.

burst it. " A man, fifty years of age, had by degrees lost the sight of the left eye ;—a year afterwards, a round white speck formed on the cornea, and in three months it changed to a blue colour ; for other nine months it remained in the same state, and then became inflamed, but the inflammation soon went off. One day, after this, the patient felt his eye so much distended, that it appeared to him as large as a hen's egg. This sudden swelling was accompanied with acute pain ; and when slightly pressed, the pain became extremely violent, and darted through the whole head ; at the same moment, blood flowed from the eye-lid, when the pain began to lessen, and went off entirely in half an hour. The bleeding lasted two hours, and there were from five to six ounces of blood discharged—the eye-ball was afterwards completely destroyed."

A gentleman had a small tumour growing from the iris, which had frequently filled the anterior chamber with blood, but which was always soon absorbed.

EXPLANATION

OF THE

Plates.

EXPLANATION

OF THE

PLATES.

PLATE I.

The three figures of this Plate are grouped together, in order to contrast the variety in the appearances of the peculiar Inflammation represented in each.

Fig. 1.—Represents the Conjunctiva covering the sclerotic coat, and lining the eyelids, inflamed to a considerable degree, in the eye of a young boy, eight days after the commencement of the disease. The inflammation increased for several days afterwards,

so that this drawing may be said to represent the disease in its first or active stage.

The upper eye-lid is elevated, in order to show a larger surface of the eye-ball. The colour, mode of distribution, and general appearance of the blood-vessels, were accurately copied from nature. They are of a deep scarlet hue; they do not seem to run to any particular point, but anastomose freely with each other, and give off branches over the whole surface of the eye-ball. They appear lying loose, and quite superficial, so that they could be readily elevated with forceps, or on the point of a needle. The conjunctiva was slightly swelled. The cornea remained quite transparent, and none of the red vessels passed over it. There is a light blue circle at the circumference of the cornea, resembling the *Arcus Senilis* of old age.

The palpebræ were considerably swelled, and had a dark purplish hue externally. Their internal surface had a villous appearance, being very turgid with red vessels,

which were so numerous as not to be distinguished in separate trunks. The *Ciliæ* are glued together with a puriform fluid, and several globules of pus are seen on the under eye-lid, floating among the tears, and collected towards the angles of the eye.

Fig. 2.—This drawing represents Inflammation of the Cornea and Sclerotic coat, and the commencement of a corneal speck. The general expression given to this eye differs much from that of Fig. 1., and this arises chiefly from the appearance of the blood-vessels. The inflammation is confined, or is at least much more remarkable on one-half of the eye-ball. There are numerous blood-vessels on the inferior part of the sclerotic coat, which pass over the transparent cornea, and form on it a red cluster. They are of a deep scarlet colour, tinged with brown; they run nearly in straight lines on the sclerotic coat, and do not give off any branches till they approach the cornea. Each trunk is seen distinct,

and the vessels appear deeper, or more in the substance of the sclerotic coat, than those in Fig. 1. There is a small circumscribed Speck near the centre of the cornea, of a circular form, and rather more opaque at the centre than at the circumference. A blood-vessel is seen running towards it. The whole anterior chamber had that muddy, turbid appearance, which disappears instantaneously when the aqueous humour is evacuated: The eye-lids were turgid with vessels, but they were neither much swelled, of the livid colour, nor covered with a puriform fluid, as those in Fig. 1.

This drawing was taken from a young woman, who had symptoms of inflammation in the eye during six weeks, which came on suddenly, without any known cause, and was accompanied with violent pain in the temples and eye-ball.

Fig. 3.—This drawing represents a Pustule of the Cornea advanced to ulceration,

and the peculiar Inflammation which accompanies this disease.

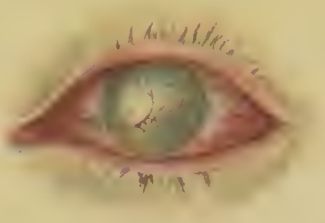
The blood-vessels are of a pale livid colour, and are most numerous on that part of the white of the eye adjoining the pustule. They also appear superficial when compared with those in Fig. 2.; and they anastomose freely with each other, each trunk being easily distinguished. The small white spot on the centre of the pustule is the chalky looking matter so frequently covering ulcers of the cornea. There is also a diffused opacity round the cornea, immediately contiguous to the spot. The eyelids are not affected, and there is no appearance of puriform matter among the ciliæ.

The drawing was taken from a young girl, six days after the commencement of the disease; and she had been subject to frequent attacks of it.

PLATE II.

The three figures of this Plate are intended to illustrate the changes which take place in the Corneal Conjunctiva from Inflammation.

Fig. 1.—Represents the inflammation of a small portion of conjunctiva covering the cornea, as described in page 7. The diseased portion appears of an opaque white colour, a little elevated above the natural surface of the cornea, and extending from the sclerotic coat to beyond the centre of



the cornea. It has an oblong form, except near its extremity, where it becomes broader, and two large vascular trunks pass to the cornea, and are ramified into a number of minute branches when they reach the extremity of the opaque spot. The whole cornea is a little clouded. The eye-lids are swelled and turgid with blood. A comparison of this figure with Fig. 2. Plate I. will illustrate the difference in the appearances of the inflammation of the corneal conjunctiva with that which accompanies the common corneal speck.

This drawing was taken from a young lady about eighteen years of age, who had suffered from inflammation in her eye during three months, attended with pain in the head and temple, intolerance of light, and increased secretion of tears. She had formerly four similar attacks, each lasting between three and four months. In this case the vessels going to the corneal conjunctiva were divided, by introducing behind them a very sharp pointed curved needle, then ele-

vating them, and cutting away the elevated portion with a pair of scissors. This operation was followed by an increase of the inflammatory symptoms for a few days, but they gradually abated ; the diseased portion of conjunctiva came away in the form of a slough ; and, after the lapse of a considerable time, the transparency of the cornea was nearly completely restored.

Fig. 2.—Represents a portion of the Corneal Conjunctiva inflamed in the eye of a child. The peculiar characters of this affection form a striking contrast with the appearances of inflammation of a portion of the proper corneal substance, as represented in Plate I. Fig. 2.

Fig. 3.—In this eye the whole Corneal Conjunctiva has become thickened, opaque, and filled with varicose blood-vessels, in consequence of an attack of puriform ophthalmia, a disease where the inflammation

affects chiefly the conjunctiva. The whole opacity is not, however, confined to the corneal conjunctiva in this instance, but extends to the substance of the cornea, particularly its central portion.

PLATE III.

The three figures of this Plate are intended to explain the most remarkable appearances of *Pterygium*, varying in thickness from a thin membranous pellicle to a fleshy, cartilaginous excrescence.

Fig. 1.—Represents a thin membrane, covering about one-half of the cornea and sclerotic coat, which had nearly destroyed vision. It is interwoven with blood-vessels, which appear lying superficial, and of a very considerable size; both the vessels and

the membrane are of a dull crimson colour. The inferior *tarsus* of this eye is also diseased, the edge being of an irregular form, and the natural figure of the cartilage destroyed. Almost all the *ciliæ* have dropped out, and in several places the edge of the tarsus is of a bright crimson tint. The gentleman, from whose eye this drawing was taken, had been, during a course of many years, repeatedly attacked with acute inflammation in the eye. It was proposed, that the portion of the conjunctiva which was filled with vessels, should be removed close to the circumference of the cornea. In order to do this, a curved needle was introduced underneath them, and they were then elevated, and the elevated portion snipped off with scissors. The part of the membrane, which remained on the cornea after this operation, appeared very loose, and was readily dissected off. A few vessels which were now seen in the substance of the cornea, increased in size for some days, but they gradually diminished, and in a short time the vision began to im-

prove; and, after several months, though the other eye was completely lost, he so much recovered, that he was able to read and write. Two years after the operation, his eye continued well.

Fig. 2.—Is a drawing of the more usual appearance of the *Pterygium*, where the triangular form is well marked. Its base adheres to the semilunar membrane, and its apex extends a little way over the cornea. The vessels, in this case, instead of being of a dull crimson colour, as in Fig. 1., were of a pale scarlet. They are in considerable numbers, all small, and running in nearly straight lines towards the apex of the pterygium. The new formed body appears of considerable thickness, and lies loose, except at its base and apex. I had an opportunity of observing the progress of this case for upwards of eight years. When I first saw the disease, it had the appearance of a small globule of fat near the junction of the cornea and sclerotic coat, and it gradually became

larger, so that its base adhered to the semilunar fold, and its apex passed over the edge of the transparent cornea.

Fig. 3.—This drawing was taken from the eye of a young gentleman, who had the common triangular-shaped Pterygium from early life. Its growth having become rapid, a surgeon employed repeated scarifications; but these, instead of causing it to diminish, made it grow more rapidly. The mass was so large, as to separate the two tarsi, and involve the semilunar membrane and lacrymal caruncle. The surface of this pterygium was very irregular and rough, and some of the most prominent parts were white and hard; the rest of the tumour was of a bright red colour, bordering on vermilion. Round the anterior extremity there was a ring of opaque cornea, more like the *Arcus Senilis* than common speck.

PLATE IV.

Fig. 1.—Represents a tumour of the corneal conjunctiva, described in page 34, which was remarkable for its thickness, as well as its peculiar brown colour. It was first observed after an attack of inflammation. It had grown very slowly; for, after several years, it had covered only one half of the cornea. Its surface was irregular, the mass being composed of several smaller swellings, and it was plentifully supplied with red vessels. I am indebted to Mr Standard of Taunton for the elegant drawing of this dis-

ease, as well as for an opportunity of examining the patient.

Fig. 2.—Represents a diseased growth from nearly two-thirds of the corneal conjunctiva, which, from its firm granulated texture, very much resembled some of the warty excrescences which are formed on other mucous surfaces. This tumour, which was of a flesh colour, had grown very slowly on the eye of a patient sixty years of age. *

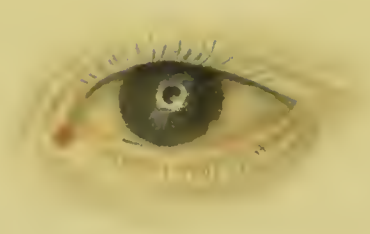
Fig. 3.—Congenite fleshy excrescence, growing both from the corneal and sclerotic conjunctiva, with a tuft of hair in its centre. This case is described in page 32.

* See page 34.

PLATE V.

The three figures in this Plate are intended to illustrate three of the more remarkable appearances of ulceration of the cornea.

Fig. 1.—Represents a deep conical cavity in the centre of the cornea. There is a degree of muddiness in the cornea, and it is very considerably swelled and thickened. This ulcer was formed in consequence of the suppuration of a pustule in a child's eye. By the continued use of the vinous tincture of opium for some weeks, the cavity of this



ulcer was filled up, and the transparency of the cornea considerably restored. *

Fig. 2.—Represents a cornea on which there are two ulcers which have an opaque white appearance, their surface resembling a piece of wet chalk, as described page 62.

The edges of these ulcers are rounded, smooth, and considerably elevated above the level of their surfaces. The rest of the cornea is quite transparent. On the nasal side of the albuginea were a considerable number of blood-vessels, terminating in an *Ecchymosis.* The eyelids are a little swelled and turgid. This drawing was taken from a gentleman upwards of fifty years of age, whom I saw along with Dr Monro. The ulcers appeared after a violent attack of inflammation, which was produced by a blow on the eye, and which had lasted four months. The same species of ulcer which has penetrated into the anterior chamber, and allowed the

* See page 54.

iris to protrude, is delineated in Plate X. fig. 1. Vol. II.

Fig. 3.—Shews the appearance of the cornea produced by the application of corrosive substances, as described in page 61.

The patient from whom this drawing was taken was a soldier who had suffered from ophthalmia during the Egyptian campaign, and who had since been subject to weak eyes. A quantity of lime accidentally got within the eye-lids, which gave excruciating pain in the eye and head, produced a great degree of swelling and redness of the whole conjunctiva, and rendered about two-thirds of the cornea so obscure as entirely to destroy his sight. After the violent inflammatory symptoms were abated by bleeding at the temples, scarifying the eye-lids, &c. the process of separation of the dead portion of conjunctiva commenced; and the drawing was taken when the process had a little way advanced. The slough at the junction of the cornea and sclerotic coat be-

gan to separate, and vessels branched out, so that the division between these two coats, which at one period could not be distinguished, now became distinct. The separation of the slough went on from the circumference towards the centre, leaving the portion of the cornea underneath very vascular. When the white slough was touched with a pointed instrument, it appeared as if loose and moveable, and was very hard and brittle.

The whole cornea, except a small line at its upper part, is seen covered with the opaque matter; and there is also some remains of it on parts of the sclerotic coat. The sclerotic conjunctiva was a little tumefied, and, instead of lying loose and moveable, it was hard and firm when cut with a scarificator. In some places it is considerably inflamed, and amidst the white portions small ramifications of red vessels may be observed.

Various applications were made use of during the treatment of this patient, but

none had such a remarkable effect in abating the inflammatory symptoms and pain, and promoting the separation of the slough, as a solution of the nitrate of quicksilver. I had an opportunity of observing the progress of the case for five months, and, at the end of that period, the whole of the slough had separated, except some small ragged portions towards the centre of the cornea. There was a degree of obscurity, apparently seated deep in the cornea; but the patient's sight was so much recovered, that with this eye he could distinguish large objects.

In one case I saw an appearance of the cornea precisely similar to the above, from some melted tallow falling into the eye; but in a few days the cornea resumed its transparency.

PLATE VI.

Fig. 1.—Represents matter effused between the laminæ of the cornea and in the anterior chamber. There is also an ulceration of the corresponding surface of the cornea, along with a considerable degree of obscurity of that tunic. Both the sclerotic and conjunctiva are much inflamed, and some red vessels may be seen passing over the cornea.

When mining, a piece of coal struck this patient's eye; and the drawing was made twenty-one days after the accident. He

suffered great pain, which increased daily, and became so severe in the forehead and temples, as entirely to deprive him of sleep. The vision of this eye was destroyed, and he could only distinguish very large objects with the other, in consequence of a speck of the cornea which had formed in early life. I made an incision through the cornea similar to that for the extraction of a cataract, and several drops of matter rushed out along with the aqueous humour. The effect of this discharge was almost instantaneous; for, though the operation caused considerable smarting, and the fixing of the eye-ball produced a good deal of uneasiness, yet, as soon as the contents of the anterior chamber were discharged, the deep-seated pain in the eye-ball, and the oppressive pain in the head, vanished. The pain never again returned, and the cornea daily regained its transparency, by scarification of the eye-lids and the application of stimulating ointments, so as to enable him to be again employed as a miner.

Fig. 2.—Represents the appearance of the cornea after it has been ulcerated, and the ulcer penetrated into the anterior chamber. The opaque portion of cornea marks the extent of ulceration. A red vessel is seen ramified through it, and the pupil is obliterated from the extent of the adhesions between the iris and cornea. This is one of the states of the eye in which an artificial pupil may be made with advantage. *

Fig. 3.—Represents the cornea completely disorganized from ulceration, its transparency being destroyed, and throughout converted into an opaque white mass, in which some red vessels are distributed. The anterior chamber is obliterated, and vision irrecoverably destroyed. †

* See page 82.

† See page 127.

PLATE VII.

The three figures of this Plate represent the more striking forms of the corneal Speck.

Fig. 1.—Shows the cornea in the *first* form of corneal Speck, where it has become nebulous, or a general cloudiness diffused over it. The degree of opacity is such, that the iris and pupil can be seen through it very indistinctly, and some parts are rather more opaque than others. The obscurity of the cornea was, in this instance, occasioned by that disease of the tarsi called *Entropeon*,

in which the tarsi are inverted upon the eye-ball. All the ciliæ have dropped out; the cartilages have lost their natural form, and their edges become ragged. In this case, in order to restore the two tarsi to their natural situation, the ingenious operation of Mr Crampton of Dublin was employed, viz. dividing them at their junction, at the temporal angle of the eye, and, after thus liberating the two eye-lids, keeping them in their natural situation, in the manner Mr Crampton points out. *

Fig. 2.—This drawing is intended to represent a corneal Speck, of the *second* form. The Speck is distinctly circumscribed, but not of an equal degree of opacity throughout. It is so situated, as to obscure nearly the whole pupil. Towards its circumference, the iris may be observed shining through it. One small vascular trunk creeps along the

* Vide an Essay on the Entropeon, by Philip Crampton, M. D. London, 1805.

sclerotic coat, passes over the edge of the cornea, and is lost in the speck. The patient had been seized twenty-two months previously with a violent inflammation in his eye, after which the speck was formed, and, at the same time, the inferior eye-lid was inverted.

The tarsus is completely out of view, and is inverted upon the eye-ball; but the integuments of the eye-lids were so loose, that it could be easily put into its natural situation, where it remained till, by a convulsive twitch of the eye-lids, it was again inverted. The integuments of the upper eye-lid are loose and puckered, from the constant winking, and corrugation of the eye-brow, which accompany this disorder.

This and the former Figure show two very different varieties of the Entropeon, and explain also the different modes of treatment necessary to be employed in each.

The tarsus was here restored to its natural situation by removing a portion of the skin of the eye-lid, and keeping the edges of the

wound in close contact, by three ligatures and adhesive plasters. When this was done, the inflammation speedily abated, and the speck diminished in opacity. Thin layers of it were also removed with a knife, so as to destroy the red vessel which passed into it; and by this treatment it became so small in a few weeks, that the man, from being quite blind, having also lost completely the sight of the other eye, was enabled to walk about the streets, and distinguish objects with considerable accuracy.

Fig. 3.—Shows the appearance of a very thick pearl-coloured Speck, of the *third* form, where, in consequence of an adhesion of the iris to the cornea, the pupil is drawn from the centre of the eye, and contracted to a very small point, so as nearly to destroy vision. The boy, from whom the drawing was taken, had lost also the sight of the other eye, from a violent inflammation after measles. It is one of those few states of disease where an artificial pupil may advan-

tageously be attempted, but, in this instance, the boy was too young to submit to the operation.

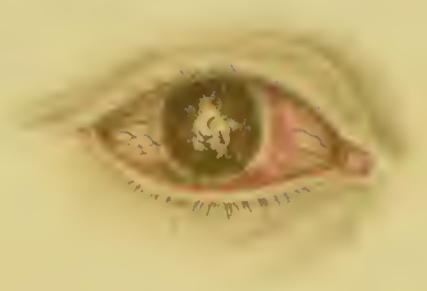


PLATE VIII.

Fig. 1.—Represents a corneal Speck of the most opaque, and, indeed, of the most incurable kind. It occupies the centre of the cornea, and is of a very irregular shape. It is of a pearl-white colour, and is nourished by several red vessels. The cornea has lost its smooth spherical surface, from the cicatrix of an ulcer on the central part of the opacity. The speck is so large and opaque as to allow only a very small portion of the iris to be distinguished through it at its circumference. The cornea and iris also ad-

here to one another, and near the centre of the opacity is a small black spot, which is a fistulous orifice, communicating with the anterior chamber, described in page 112. The woman, from whom the drawing was taken, had suffered repeatedly from violent attacks of inflammation in the eyes during three years.

Fig. 2.—Represents a complete Staphyloma of the cornea in a man twenty-five years of age. It was produced by a violent inflammation, which followed a wound of the eye with a sharp-pointed instrument, two years before. It is of such a bulk as not to be entirely covered by the eye-lids. There still remains a line of division between the cornea and sclerotic coat. The cornea is formed into a tumour, nearly globular, and of an opaque white, and, in some parts, of a bluish, pearl colour. Over several parts of it are seen the ramifications of red vessels. The sclerotic coat has lost its natural whiteness and lustre, and has a greenish hue, an

appearance not unusual after suffering from inflammation. The palpebræ are inflamed, and many of the ciliæ have dropped out.

Fig. 3.—Is an example of what has been called the *Partial Staphyloma ;*—only a portion of the cornea being affected. The distinction is a useless one, both in a pathological and practical point of view. In this case, where the disease came on in consequence of the other eye having become staphylomatous from an wound, a portion of the cornea became obscure, and more prominent than natural; and although a part of the cornea immediately opposite the pupil remained transparent, yet the increased sphericity destroyed vision. The speck was of a pearl colour, and nourished by a red vessel. An adhesion had taken place between the cornea and iris.

PLATE IX.

Fig. 1.—Is an outline taken from the eye, described in page 129, when viewed laterally, showing a cornea which has assumed a conical form, whilst, at the same time, it remained transparent.

Fig. 2.—This is an outline of the case described by Beer, as quoted in page 135, in which the cornea is very much distended.

Fig. 3.—This is a magnified view of Staphyloma, showing the mode of distribution

of its blood-vessels. The appearances of the two large trunks which advance to the apex of the tumour were very remarkable, from the difference in their colour at different parts. About one half of the trunk was of a pale livid hue ; the contiguous portion became suddenly of a deep crimson, and the minute ramifications were of a reddish brown tint. It is difficult to give a satisfactory explanation of this appearance, but to the physiologist the fact appears interesting. The difference in the quantity and in the chemical qualities of the blood in the trunks and extremities of the vessels, and the difference in the thickness of the coats of the vessels in the different parts, may each have a certain share in producing these appearances.

Printed by George Ramsay and Company,
Edinburgh, 1819.